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J.L. Ellis

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THE DEVELOPMENT OF A NEW MEASURE OF CREATIVE ABILITIES IN GRADE FIVE CHILDREN

by

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Abstract

The development of the instrument, Solving Real Problems: exercises in productive thinking (SRP), was prompted by the intent to design creative problem solving tasks that would be:

(1)stimulating from the examinee's point of view;

(2)complex;

(3)logically related to creative behavior as it occurs in the examinee's "everyday world";

(4)likely to provide for qualitative indices of originality or creative thinking.

To develop SRP tasks, subjects were first asked to submit examples of what they considered to be "everyday, high-interest problems" expressed in the format of "Something I want to do and why I can't do it." From a pool of problems thus obtained, tasks were selected which appeared to allow for breadth in solution approaches. Attention was also given to ensuring variety in terms of content and apparent difficulty of the problems. Examinees were asked to generate as many different solutions as they could imagine for each problem.

An exploratory approach to the development of scoring protocols for the SRP was utilized in order to provide for the identification of manifestations of creativity that might be idiosyncratic to the age level of subjects in the study or to these kinds of tasks.

Data collected included the SRP, an external criterion of creativity, and measures of ability and personality.

Seven SRP scores were developed: Fluency, Flexibility,

Wishing, Personal Capability, Fantasy Factor, Analytic Thinking, and Conceptual Thinking. Stepwise regression analyses revealed considerable overlap between the academic achievement measure and the SRP variables -- Fluency, Flexibility, and Personal Capability -- in predicting to performance on the external criterion. Discriminant function analyses indicated that the SRP variables, Analytic Thinking and Conceptual Thinking, were the most powerful discriminators of the Creative Group (as defined by performance on the external criterion). These two SRP variables were relatively independent of academic achievement. Convergent validity analyses involving the external criterion, the SRP variables, and case study variables supported a dual ability/personality interpretation of the SRP variables, Conceptual Thinking and Analytic Thinking. While most SRP variables provided little information beyond that available from measures of academic achievement, Conceptual Thinking and Analytic Thinking were judged to have promise for further research and development work in the measurement of creativity.

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I. INTRODUCTION AND RATIONALE

1.1 Background Of The Problem

Gowan (1971) has suggested that creative individuals are not that much different from other people, but that something has happened to "turn them on". MacKinnon (cited by Gowan & Demos, 1964), in discussing a particular type of creative person has written:

> He is typical of many who make up for what they lack in verbal intellectual giftedness with a high level of energy, a kind of cognitive flexibility which enables them to keep coming at a problem with a variety of techniques from a variety of angles; and being confident of their ultimate success they persevere until they arrive at a creative solution. This kind of person should remind us that creative giftedness is not necessarily to be equated to high verbal intelligence. (p.71)

The role of temperament, motivation, or personality in creativity has been underscored in definitions of creativity as well as by empirical work. Crutchfield (cited by Blank, 1982), for example, has referred to creativity as:

> . . . a convenient summary label for a complex set of cognitive and motivational processes which are involved in perceiving, remembering, thinking, imagining, . . . (p.1)

Similarly, Treffinger (1980) has written:

> Creative talent represents a complex synthesis of cognitive and affective processes, and its expression is influenced by environmental or situational factors. (p.23)

Some studies of individual differences related to

creativity among members of specific groups have shown the more creative members to be different from less creative members in terms of personality characteristics rather than in terms of specific cognitive abilities (Barron & Harrington, 1981).

Efforts towards identifying creative individuals in the school setting have included the development of instruments for assessing either creative personality characteristics or creative abilities.

Rekdal (1977) has reviewed personality inventories as tests of creative potential for the purpose of assessing which ones have possible use value. He noted that it was not yet clear that such tests could be used as screening devices since profiles of creative adults may be very different from profiles of creative youngsters. There is also the problem of unreliability of such instruments for adolescents. In their review, Barron and Harrington (1981) mentioned empirical work which had identified discrepancies among the personality characteristics of creative individuals at different age levels.

Petrosko (1978) reported on an assessment of most creativity tests that were commercially available for use in elementary schools in the United States. When summarizing his findings he stated that no tests were found that reported convincing validity data, i.e., moderate or high correlations between the instrument and some relevant behavioral outcome, such as rated creative behavior. Instead, the most frequently reported kind of validity was based on divergent or factorial validity, i.e., reporting factor loadings or correlations below

.20 between creativity and noncreativity measures. Barron and Harrington (1981), on the basis of their review of literature regarding divergent thinking tests, concluded that:

> . . . some divergent thinking tests, administered under some conditions and scored by some sets of criteria, do measure abilities related to creative achievement and behavior in some domains. (p.447)

They commented that where divergent thinking test scores have failed to correlate positively to a significant extent with plausible indices of creative achievement and behavior that this may have been due, in part, to the field-specific relevance of many divergent thinking abilities and the primitive state of knowledge regarding the abilities underlying creative behavior in any given field. They drew attention to investigators who had been attempting to match divergent thinking tests to relevant domains in areas such as musical creativity or scientific creativity.

While a specific solution to the problem of measuring creative abilities has not yet been identified, the problem itself has been widely discussed and some guidelines have been offered regarding improvements beyond existing measures.

Torrance (1962), commenting on investigators' efforts to assess creativity in young children, has stated:

> It seems clear that much of the confusion stems from the ways in which each scholar has limited his observations of the manifestations of creativity. Most of the work which has been done reflects little recognition of the fact that no single test or area of observations taps all of the resources of the individual for creative thinking and that the same test or kinds of observations are not valid or

adequate at all age levels. (p.23)

Such a statement suggests a need for more openmindedness about the ways in which children can/may manifest creativity at different ages rather than expecting any given test to be adequate and valid at all age levels. Treffinger, Renzulli, and Feldhusen (1971) have also acknowledged the need to establish differential age and sex criteria as an important issue in research on creativity and its assessment.

Treffinger et al. (1971) have presented a number of concerns regarding tasks intended to measure creative problem solving ability. Four of these concerns appear to be somewhat translatable into guidelines for the development of promising new measures of creative abilities.

> There is a great deal to be learned about the assessment of creative problem-solving. It is quite clear that simple measures of fluency, flexibility, and originality are not sufficient. Perhaps substantial effort must be given to finding new, more complex measures. (p.109)

> There are also a number of problems of a very practical nature to solve. How does the researcher know that what he considers creative tasks are creative and challenging for the examinee? It may be that the tasks he considers most unusual are boring, unexciting, even trivial, for the most imaginative of our examinees. (p.110)

> Another dimension of the criterion problem concerns the appropriateness or inappropriateness of our current means for assessing originality. While a few have dissented, almost everyone who has grappled with creativity research appears to be satisfied with the statistical infrequency criterion for measures of originality. . . . Perhaps our easy acceptance of

> the statistical infrequency criterion has prevented us from identifying new methods which are useful for measuring this dimension of creative thinking. Ideally one would like a qualitative index with face validity. (p.110)

> An issue of critical importance in solving the problem of assessing creative thinking is concerned with the validity of our measures. Too often, in order to develop tests which are manageable from the psychometric point of view, we have relied on tasks which may have little or no logical relationship to creative behavior as it occurs in the "real world". While there exists a substantial difficulty (identifying adequate criteria against which the test tasks can be validated), the problem warrants our attention. The "creativity" assessed by our tests, after all, should be expected to bear a resemblance to creativity as it is actually manifested among people. (p. 110-111)

Together, these concerns suggest the desirability of tasks that:

- Are stimulating from the examinee's point of view, (i.e., that will prompt children to ask questions and generate ideas);
- Are complex, (i.e., instead of being linear or single-constraint-types of problems, the tasks should involve a number of components which make possible a variety of solution approaches depending on the trade-offs one prefers to make or accept);
- Are logically related to creative behavior as it occurs in the examinee's "everyday world", (i.e., tasks that draw upon material from the child's "everyday world" experience);

and that

- Will provide for qualitative indices of originality or

creative thinking, (i.e., go beyond a simple count or infrequency index.)

With these objectives in view, the researcher had previously undertaken the development of tasks intended to tap examinees' "everyday world" creative thinking in problem solving situations (Ellis, 1975). The tasks developed comprised a test now called: Solving Real Problems: exercises in productive thinking (SRP). To develop SRP tasks, subjects were first asked to submit examples of what they considered to be "everyday, high-interest problems" expressed in the format of "Something I want to do and why I can't do it." From a pool of problems thus obtained, tasks were selected which appeared to allow for breadth in solution approaches. Attention was also given to ensuring variety in terms of content and apparent difficulty of the problems. To respond to the tasks, examinees were asked to generate as many different solutions as they could imagine for each problem. That study, conducted with grade three subjects, examined the internal consistency of tasks developed and their independence from noncreativity measures. No predictive validity data was collected. The results suggested that further development work was warranted.

The current study was intended to provide for further development of these kinds of examinee-relevant, complex tasks. The assumptions underlying tasks developed in this way are the following:

1. If problems presented on an SRP are recognizable by the examinee as being from his/her "everyday world" they will be

considered as being meaningful or plausible by the examinee.

2. If examinees and SRP tasks both come from the same restricted sub-population (i.e., a group having access to the same or similar community and geographical resources and events), then among examinees there will be some common base of knowledge regarding typically witnessed solution methods for those types of problems and resources that are generally available.

3. By resembling the examinee's own high-interest "everyday" problems, the SRP tasks should cue the use of the examinee's usual repertoire of abilities and attitudes that are typically engaged in response to such problems. Therefore, creative abilities demonstrated in response to SRP tasks should be representative of "everyday" behavior in high-interest problem solving situations. Consequently, both personality and ability should be reflected in an examinee's responses to SRP tasks.

1.2 Statement Of The Problem

The main purpose of the study was to develop an SRP test (i.e., develop tasks and scoring protocols) for a grade five sub-population and to examine the extent of convergent validity among the SRP and two external criteria of "everyday" behavior. In addition, the study also examined the relationships of these new variables to existing measures of divergent thinking, academic achievement, and self-concept.

Three methodological problems were addressed in conducting the study. First, an SRP scoring system had to be devised in a

manner that would define and record what might be various manifestations of creativity at this age level. A two-step procedure for the development of scoring protocols was explored. It involved first identifying and scoring a large number of response characteristics that might possibly be related to "everyday world" creative behavior, and secondly, examining whether such response characteristics were significantly correlated with the external criterion of creativity.

Secondly, an external criterion in the form of "everyday world" creative thinking had to be obtained in a relatively standardized manner from all subjects and had to be rated. To meet this requirement, all subjects were given the opportunity (through a standardized presentation) to develop a proposal for a high-interest class project (extra-curricular in nature). The proposals were collected as "creative products" and a scale was built for rating them.

Thirdly, case studies of selected subjects (prepared on the basis of interviews) had to be quantified to make convergent validity analyses possible. Scores were developed for case study variables that were definable as discriminators among the everyday behavior/characteristics of these subjects.

Questions Addressed in the Study

1. How might individuals manifest creativity on SRP tasks, (i.e., what definable and creativity-relevant variables would be developed from subjects' responses to the SRP tasks)?
2. How would SRP variables relate to an external criterion of "everyday world" performance, (i.e., the ratings subjects

received for their Proposals -- the plans they developed for the class extra-curricular project)?

3. How would SRP variables and the Proposal variable relate to "everyday world" behavior as determined through interviews, (i.e., the case study variables)?

4. How would the new variables (i.e, the SRP, Proposal, and case study variables) relate to an existing measure of divergent thinking, (i.e., selected tasks from the Torrance Tests of Creative Thinking (TTCT))?

5. How would the new variables relate to a standardized measure of academic achievement, (i.e., the Canadian Tests of Basic Skills (CTBS))?

6. How would the new variables relate to an existing measure of self-concept, (i.e., the Sears-Harris Self-Concept Inventory)?

1.3 Definition Of Creativity

To guide the various aspects of the study it was necessary to define creativity as ability, as personality, and as achievement.

1.3.1 Creativity As Ability

Regarding definitions of creativity, Khatena (1976) has written:

> Two definitions of creativity have been most productive of instrument development: (a)Guilford's divergent thinking and redefinition abilities as components of the Structure of Intellect Model, and (b)Torrance's definition of creativity as a process that involves sensing gaps or disturbing missing

> elements, forming hypotheses, comunicating the results, and possibly modifying and retesting these hypotheses. To these may be added such definitions as the ability to generate or produce within some criterion of relevance many cognitive associates and many that are unique (Wallach & Kogan, 1965), and the power of the imagination to break away from perceptual set so as to restructure ideas, thoughts, and feelings into novel and meaningful associative bonds (Khatena & Torrance, 1973). (p. 339)

Blank (1982) has defined creativity as:

> . . . that problem-solving process in which a goal-oriented individual brings to bear a combination of flexibility, originality and sensitivity to ideas which enables him to break away from his usual approaches and ideas into new, different and productive combinations of thought, the results of which yield solutions which add to what is already known and which are satisfying to the individual. (p. 1)

Given the intended format of the SRP tasks (i.e., examinees generate a number of possible solutions to a presented problem), and the limitations of that format -- e.g., no opportunity for examinees to test hypotheses, no invitation for examinees to make explicit how they may have redefined the problem -- the following definition was selected from those listed above:

> . . . the power of the imagination to break away from perceptual set so as to restructure ideas, thoughts, and feelings into novel and meaningful associative bonds (Khatena & Torrance, 1973). (cited by Khatena, 1976, p. 339)

The definition focusses on the importance of flexibility and originality and emphasizes the criterion of meaningfulness.

1.3.2 Creativity As Personality

Barron and Harrington (1981) reviewed the empirical work of the previous 15 years on the personality characteristics of creative people and noted the emergence of a fairly stable set of core characteristics as correlates of creative achievement and activity in many domains. These were:

> . . . high valuation of esthetic qualities in experience, broad interests, attraction to complexity, high energy, independence of judgment, autonomy, intuition, self-confidence, ability to resolve antinomies or to accommodate apparently opposite or conflicting traits in one's self-concept, and finally, a firm sense of self as "creative". (p. 454)

Barron and Harrington cautioned, however, that "the search for the taxonomic simplicity has all too often ignored the phenomenon of developmental ebb and flow in many traits" (p. 456). They gave examples of age-related correlational reversals of creative personality characteristics that investigators had identified.

Since there did not appear to be a sound basis for specifying a given set of personality characteristics for the creative child, a more general definition of the creative personality was selected. Using Otto Rank's concepts as presented by MacKinnon (1965), the "creative type", as a child, is one who is attaining a secure sense of self and who is expressing positive will in selecting, organizing, modifying, and recreating his/her own experiences. This definition suggests growing self-confidence and connotes activeness as opposed to reactiveness or passivity/acceptance. Rank's

concepts also emphasize that the creative type is motivated towards the creative expression of individuality. Torrance(1962, p. 120) has similarly observed that creative children are searching for their uniqueness.

1.3.3 Creativity As Achievement

Defining creative achievement involves specifying criteria for evaluating performances or products. Blank (1982) has recommended and discussed three criteria: novelty, usefulness, and communicability. Presented as they are in the context of evaluating students' products, Blank's discussions of these criteria are particularly useful.

> If the product or solution is to qualify in terms of the Novelty dimension, it must be judged to be original at least and preferably germinal as well. That is, the solution developed by the student must be such that it is viewed to be one that would be found only very infrequently among solutions developed by the student's peers in both age and experience to like problems. Further, it should be a solution or product that can lead to the discovery of other problems or to the development of more sophisticated solutions to the present situation. (p. 10)

> . . . having met the criterion "new", the solution must also meet the criterion "useful" in the sense that it is an appropriate and useable solution. (p. 10)

> Is the solution "saleable"; is it well thought out; has it been well developed? . . . if the solution is uncommunicable or unsaleable for whatever reason, it fails to meet an essential criterion of a "creative solution". (p. 10)

For the purpose of guiding the rating of the criterion

measure of creativity, the Proposals, the creative achievement or product was defined as one which met all of the three criteria: novelty, usefulness, and communicability.

1.4 Summary

This chapter has presented the background to the problem, namely, research findings and arguments which suggest potential value in exploring the use of SRP tasks for measuring creative abilities in children.

The problem has been stated in terms of the following research questions to be addressed in the study:

1. How might individuals manifest creativity on SRP tasks?
2. How would SRP variables relate to an external criterion of "everyday world" performance, (i.e., the Proposal ratings)?
3. How would SRP variables and the Proposal variable relate to everyday behavior as determined through interviews, (i.e., the case study variables)?
4. How would the new variables relate to an existing measure of divergent thinking?
5. How would the new variables relate to a standardized measure of academic achievement?
6. How would the new variables relate to an existing measure of self-concept?

Finally, definitions of creativity (as ability, personality, and achievement) to guide the research have been specified.

While Section 1.1, the Background of the Problem, has served to establish a rationale for the design of SRP tasks,

Chapter II reviews literature regarding (1)general approaches to the identification of creative individuals, and (2)problems in helping classroom teachers to identify creative students.

II. REVIEW OF THE LITERATURE

2.1 Approaches To Identifying Creative Individuals

Three general approaches to identifying creative individuals use measures of ability, or personality, or achievement (Barron et al., 1981). Arguments regarding the use of these are presented here. Identification efforts using measures of achievement are referred to as the product approach. Those using measures of ability or personality are grouped together in what is called the process approach (Gowan et al., 1964).

2.1.1 Product Approach

Some arguments for the product approach are based on what might be considered the logical futility of the process approach. That is, while the process approach attempts to determine an individual's capacity for creativity, it does not clearly indicate whether or when the individual will use this capacity. It has been suggested that the human mind probably always has had creativity within its capacity and that therefore one can only discriminate among people by examining their products (Nicholls, 1972). On a similar theme, Kagan (1967) has compared the enterprise of trying to predict creativity from capacity to the absurdity of trying to predict number of children on the basis of fertility. He argued that the result of this approach has been a tendency to confuse capacity for creativity with the creative person, whereas fertility would

never be confused with number of children.

There has been persistent criticism that the term, creativity, may be better used to describe a rare quality or genius rather than a psychologically distinct set of individual variables (Treffinger & Poggio, 1972). Attention has been drawn to the inability of psychological measures (discriminating individuals from one another by small percentages) to reflect the large discrepancy between eminently creative individuals and those who seem to produce little that is worthy of note (Gowan et al., 1971). Nicholls (1972) has suggested that any given personal characteristic is not likely to have the same psychological significance in ordinary individuals as in eminently creative individuals. (While such variables may differentiate between known groups, they are unlikely to have predictive validity in unselected samples.) He also argued that while process variables such as divergent thinking assume a normally distributed trait, it is difficult and unnecessary to sustain a concept of a trait of creativity. Thus, he argues, it is only through creative products that creative individuals can be identified.

While arguments such as the ones listed suggest a greater degree of defensibility for the product approach, there are difficulties related to its implementation. Whether jugdes have the ability to evaluate products has been one cause for concern (Anderson, 1959; Lasswell, 1959; and Murray, 1959). Blank (1982, p. 161-162) has presented arguments for expert judgement as the most sensitive and probably the only meaningful basis for

the evaluation of creative products.

The development of guidelines for obtaining products and of criteria for judging them has been problematic (Brogden & Sprecher, 1964; Ghiselin, 1963; Kagan, 1967; Shapiro, 1970; Treffinger et al., 1971).

How products are obtained for evaluation purposes raises a number of issues. Requesting products for evaluation, the "work samples" approach, rather than examining naturally occurring ones may introduce aspects of motivation and work habits that may not be typical for the producers (Brogden et al., 1964). Blank (1982) has presented a number of characteristics or elements of the problem solving situation which are essential if the creative process is to be engaged in the generation of a product or solution (p. 4-5). He has outlined ways in which the elements of the problem must be: changeable or transformable; available (or activated or in focus) for manipulation at any time during problem solving; and free of constraining conditions arising from previous contexts.

The complexity of evaluating naturally occurring products has been illustrated. Kagan (1967) has proposed four criteria for judging products: novelty, appropriateness, transformation, and condensation. However, he has also discussed the many difficulties in implementing these criteria. Brogden and Sprecher (1964) presented a number of control variables and opportunity variables as being relevant when judging the creativity of the person through examination of the product. Examples of control variables were: age, position, and amount of

time in the job situation. Examples of opportunity variables were: availability of resources, psychological and social environment; and difficulty or potential of the problem area studied. Taylor (1975) has reported on the use of a Creative Product Inventory which uses seven types of criteria (e.g., originality, relevancy, complexity) to assess each of four different aspects of the product (e.g., the product's relation to the problem; the product's relation to the field). Blank (1982, p. 11-12) has provided eight criteria which the student producer can use to evaluate his/her own creative product (e.g., whether the solution leads to further ideas/solutions or is a dead end; whether the solution answers all aspects of the problem situation.) Given all the factors involved in creativity and the different meanings that creativity has for different people, there seems to be little agreement about what type of product and which evaluation criteria would be suitable (Anderson, 1959; Brogden et al., 1964; Treffinger et al., 1971).

The large issue underlying implementation of the product approach is that products are of interest as intermediate criteria for predicting to the ultimate criterion of an individual's total life production. Validation in terms of the ultimate criterion is impractical and substituting earlier criteria results in measures which "cannot strictly be regarded as either criterion or predictors, but only as guiding landmarks" (Shapiro, 1970, p. 259). Traditionally these intermediate criteria are acceptable.

2.1.2 Process Approach

Process measures of creativity are not for global measurement of creativity, but for measuring specific aspects. Gowan (1964) has classified the process researchers into three groups:

> (1)the factor analysts of ability, (theoreticians represented by Guilford) who have given much attention to divergent production, originality, ideational flexibility, and redefinition ability, and who stress that there are a number of kinds of creativity; (2)those conducting research via biographical materials, interviews, personal assessments, and personality tests, (e.g., Taylor, MacKinnon, and Barron); and (3)those primarily interested in measuring creativity in children through testing and other forms of assessments. (p. 78-79)

Arguments have been offered for the logical advantages of the process approach. Treffinger et al. (1971) have suggested that if creativity is not a stable human characteristic, then, assuming a multidimensional construct, it would seem more appropriate to determine the consistency of each component part and to place more emphasis on the stability of measures of creative behavior.

Anderson (1959), in acknowledging the problems related to questions of value and social approval of products, has suggested that by selecting people who are capable of using the creative process, this group will include those who will actually generate the products of interest to society.

Stein (1968) has expressed concern that novel products may be arrived at without the use of the creative process, e.g., through trial and error, problem solving procedures, discovery,

and serendipity. (Yet these may well be part of the creative process.) He contended that since creativity is a process, individuals selected as creative should be homogeneous in terms of process characteristics rather than insofar as their products have been judged by some group of significant others as being unique and adaptive.

Brogden and Sprecher (1964) have noted that knowledge about process variables is important for training and may be important for selection if a collection of process measures can be shown to be equivalent to product measures and more reliable.

Some weaknesses of the process approach have been expressed in terms of the limitations imposed by the use of psychometric procedures.

- Measures of creativity that fit well into established psychometric procedures have sacrificed essential attributes of the creative process, which, in real life, often takes the form of intense personal involvement applied to one real problem over a long period of time (Treffinger & Poggio, 1972.)
- Reliance on creative ability tests assigns a subordinate role to the more dynamic motivational levers that make potential creativity kinetic (Kagan, 1967.)
- Creativity occurs in a social context and one which is probably unlike the psychological testing or laboratory environment (Stein 1968.)
- It is not yet known how large a battery it will take to assess all aspects of a child's creativity (Torrance,

cited by Gowan, 1964.)

- Many divergent thinking abilities have field-specific relevance and we have only a primitive state of knowledge regarding the abilities underlying creative behavior in any given field (Barron & Harrington, 1981.)
- Tasks within commonly used existing instruments do not provide opportunities for high level creative responses (Crockenberg, 1972.)

Regarding personality measures in particular, Barron and Harrington (1981) noted that while a fairly stable set of core characteristics of creative people has emerged from empirical work, questions remain as to: which characteristics specifically facilitate creative behavior as opposed to effective social behavior of any form; which are by-products of creative achievement and recognition as opposed to more general social achievement and recognition; and which are merely noncausally related correlates of creative achievement? They also drew attention to research indicating that creative personality characteristics may vary as a function of age, sex, and field of creative activity.

2.1.3 Summary

Whether the product approach or process approach is more defensible is likely to remain an untestable question until there is greatly increased sophistication in the implementation of each approach. Interest in efficient identification methods and the desire for understanding of creativity will likely

continue to provide momentum for the process approach. Development work with the process approach, however, frequently requires the use of the product approach for obtaining validation data.

From the criticisms listed for the process approach (particularly with regards to measures of creative abilities), it would appear worthwhile to consider means for remedying the following: discrepancies between the social context for real life manifestations of creativity and the context for administration of process measures; discrepancies between real life motivational levers for creativity and process measures motivational levers; discrepancies between the content domain tapped by creative ability tests and the field in which creativity is expected to be manifested; and lack of opportunity for demonstrating high level creative thinking on creative ability tests.

The concerns outlined for the product approach suggest that a high degree of sensitivity regarding control variables and motivational context would be important in selecting or designing any product measure. Of particular value, is Blank's (1982) very comprehensive analysis of the problem solving situation and the characteristics of elements in that situation that are essential if the creative process is to be utilized in the generation of a product or solution.

2.2 Problems In Helping Teachers To Identify Creative Students

Finding effective means to enable teachers to identify creative students is problematic for two main reasons. One is the blurry distinction between "intellectually gifted" and "creatively gifted". The other is the multitude of factors that operate to depress the expression of creativity in the school setting.

Many have accepted that some gifted children are creative and some are not (Torrance & Gowan, 1971, p. 201). It has also been found that some creative individuals (as identified by their products) are not intellectually gifted (MacKinnon, 1978). To invite teachers to identify creative students on the basis of observable characteristics is not a straightforward matter since a multifaceted view of creativity would include some behavioral correlates of creativity that are closely related to intellectual aptitude (Swenson, 1978).

Torrance (1964) has summarized three characteristics which differentiate highly creative children from less creative but equally intelligent children: having a reputation for having wild or silly ideas; doing work which is characterized by the production of ideas that are "off the beaten track or outside of the mold"; and doing work which is characterized by humor, playfulness, relative lack of rigity and relaxation. Torrance and others, however, have identified a number of factors (examples below) which work against the expression of such divergency or originality.

Prince (1975), in studying the industrial setting, has

identified a number of speculation-reducing behaviors that are typically exhibited within a competitive climate and has discussed the difficulties in maintaining speculation-enhancing actions.

Blank (1982), addressing the classroom setting, has outlined means for establishing the "comfortable classroom" wherein there is freedom from negative punishing criticism and the practice of positive, helpful, encouraging evaluation. The procedures described would appear to require time, commitment, and certain kinds of knowledge or skills on the part of the teacher.

As factors inhibiting the expression of divergency or originality, Torrance (1964) has discussed: success-orientation; peer-orientation; sanctions against questioning and exploration; the equating of divergency with abnormality; the work-play dichotomy frame of reference; heterogeneous grouping; and constraints such as time pressures, scheduling, and the teacher's view of the role of the teacher.

It would seem that teachers may have limited opportunities to observe evidence of creativity among their students and may have difficulty differentiating between creativity and intellectual ability.

III. METHODOLOGY

This chapter is organized in the following manner to present the research methodology:

Population and Sample;

Instruments Used;

(a)Sears/Spaulding Self-Concept Inventory;

(b)Canadian Tests of Basic Skills;

(c)Torrance Tests of Creative Thinking;

Instruments/Variables Developed;

(a)SRP tasks, scoring protocols, and variables;

(b)Proposal activity, rating scale, and scoring; and

(c)Case Study preparation and variable development.

Study Procedures and Timeline.

3.1 Population And Sample

The population for the study were the grade five students in one school district. The study sample included 250 grade five students from ten classes located in eight schools. One of the classes was a grade four/five split. The mean age as of September 1st of the school year was 125 months with a standard deviation of 6 months.

Schools selected were the only eight to respond with full commitment to a district-wide invitation for schools to volunteer to participate in the study. Another four schools expressed some interest and these provided six grade five classes for piloting work involved in the study. School administrators received and responded to the invitations after

determining that there was interest on the part of a grade five teacher in the school.

The district contained approximately 26 schools that included grades K-7. The city had a population of over 65,000, was located in the interior of the province of British Columbia, and featured the province's four main industries of mining, forestry, farming, and tourism.

Among the teachers participating in the study, four were male and six were female. In the six pilot classes, four teachers were male and two were female.

3.2 Instruments Used

3.2.1 Sears/Spaulding Self-Concept Inventory

Student self-concept regarding self-image and general personal competence in school activities and classroom tasks was measured using an inventory revised by Spaulding (1966) from one developed by Sears (1963). The revised instrument was extended to include items related to divergent thinking and attitudes related to creative problem solving along with those related to mental abilities of a more conventional nature. Harris (1977) used the inventory with grade five students to obtain measures of self-concept regarding self, problem solving, and human relations skills.

The measure utilizes 90 items to be assessed on a modified Likert scale and administered in a group written untimed basis. Test-retest reliability for this measure as determined by Spaulding was reported as .85 and .82 for height of self-concept

and differentiation of self-concept respectively. He reported the instrument as being used successfully with grade four and six students. Spaulding had offered a classification of items along eight major dimensions: social behavior; attractive appearance; social relationship with teachers; work habits; mental abilities including creativity; mental attitudes; human relations skills; and school subjects.

This 90-question instrument was shortened by the researcher to 63 questions by deleting items proportionately from each of the eight classifications of items provided by Spaulding. The resulting instrument is included in Appendix A. Teacher's instructions for administering the questionnaire are included in Appendix B.

To determine whether subtests within the questionnaire might be definable, an internal consistency analysis (Lertap, UBC) of the completed questionnaires (n=241) was carried out The Lertap analysis computed a Hoyt estimate of reliability of .96 for the total test. This indicated that the instrument was univariate and that it would be appropriate to use subjects' total scores to represent their performance on the questionnaire. Therefore, only subjects' total scores on the questionnaire were used in the analyses in the study. The obtained Hoyt estimate of reliability also indicated a high degree of internal consistency reliability for the shortened instrument.

3.2.2 Canadian Tests Of Basic Skills

To include a standardized measure of subjects' academic achievement, results from the spring administration of the CTBS were obtained from the school district. These tests were written approximately five months prior to the commencement of data collection in the study.

The CTBS includes the following subtests: Vocabulary, Reading, Language, Work Study, and Math. If all subtests have been completed, a composite score is also reported. The CTBS composite score was used as the variable representing academic achievement.

Reliability. In presenting a split-halves reliability analysis for the test battery, CTBS, the publishers reported a reliability coefficient of .98 for the Composite Score for Grade Four, Level Ten (King, 1975, p.52).

3.2.3 Torrance Tests Of Creative Thinking

Three of the tasks from the TTCT were used: the Product Improvement Activity (Verbal Test, Form A); the Incomplete Figure Activity (Figural Test, Form A); and the Repeated Figures Activity, i.e., Circles (Figural Test, Form B).

These tasks were selected from the TTCT because they appeared to be logically related to the kinds of functioning required on SRP tasks.

The Product Improvement Activity requires examinees to list all the different ways that a toy could be improved to make it more fun for children to play with. This is very similar to the

SRP's requirement that examinees list multiple solution methods.

Regarding the Incomplete Figures Activity, Torrance (1966a) has written:

> As is well known in Gestalt psychology, an incomplete figure sets up in an individual tensions to complete it in the simplest and easiest way possible. Thus, to produce an original response, the subject usually has to control his tensions and delay gratification of this impulse to closure.(p. 14)

This type of functioning would seem to be similar to that required by the SRP where the examinee must remain open to alternate approaches to the problem or alternate reformulations of the problem.

The Repeated Figures Activity using the Circles tests the ability to make multiple associations to the same stimulus and requires the ability to disrupt or destroy an already complete form. This task would appear to be related to the ability to free-associate or to redefine problems which may also facilitate performance on SRP tasks.

Scoring. The verbal task, Product Improvement, was scored for Fluency and Flexibility following the procedures described in the scoring guide provided by Torrance (1966b). The verbal task was not scored for originality as examination of subjects' responses suggested that the available protocols for scoring originality were out-of-date.

The Incomplete Figures Activity was scored for Fluency and Originality using the recently developed streamlined scoring guide (Torrance & Ball, 1980). The Repeated Figures Activity was also scored for Fluency and Originality using the

streamlined scoring guide (Torrance & Ball, 1978).

Both figural tasks were also scored for components of the Creative Strengths score described in the scoring guides. To develop the Creative Strengths score, responses to the figural tasks were scored for the nine characteristics of: movement; expression of emotion; articulateness; humor; richness of imagery; internal visualization; unusual visualization; combinations; breaking/extending boundaries.

Reliabilities. Various reliability coefficients ranging from .88 to .99 for fluency and flexibility for verbal and figural forms using test-retest, inter-scorer, and intra-scorer reliabilities have been reported (Torrance 1966a).

Torrance, in commenting on a list of test-retest reliability studies, suggested that researchers tend to handle the motivational aspects of testing more adequately when they conduct experiments than when they collect normative data. He noted that since motivation is indisputably important in creative thinking,it is to be expected that motivational conditions affect test-retest reliability. The teacher's instructions for administering the Torrance tasks are included in Appendix C.

Regarding the streamlined scoring methods, Torrance and Ball (1980, p.6) have reported that several scoring reliability studies have been completed and indicate that it is possible to keep the scoring reliability of the norm-referenced (i.e., figural fluency and originality in this study) and criterion-referenced (i.e., components of the Creative Strengths score)

measures of these new scoring concepts above the .90 level. Specifically, for fifth grade students' booklets they reported scoring reliabilities of .99 for fluency and .99 for originality. For the component characteristics of the Creative Strengths score, reported scoring reliabilities ranged from .42 for Internal Visualization to 1.00 for Movement/Action.

3.3 Development Of Instruments And Variables

3.3.1 Development Of SRP Tasks And Variables

Task Development. To obtain a pool of everyday, high-interest problems from which to select tasks for an SRP, the "What's a Real Problem?" Questionnaire (WRPQ) was administered in all of the study classes by the classroom teachers. A copy of the questionnaire is included in Appendix D. Instructions for administering the questionnaire are included in Appendix E.

The Problems obtained through the WRPQ were examined in order to acquire familiarity with subjects' interests and usual ways of defining problem situations.

The following problems were selected to be piloted as SRP tasks:

(1)I want to build a model jet but I don't have the money for a set.

(2)I want to make something electrical but I don't have the materials I need.

(3)A lot of kids in our city want to have a horse but their parents can't afford it and they have no place to keep one.

(4)I want to keep my sister from coming in my room because she

messes it up, she bugs me, and she takes my things.

(5)I want things to go better in my life but I don't think I can do anything.

(6)I want to stop wars but who would listen to a kid in elementary school.

SRP Pilot Form A included problems (1), (3), and (5) and Form B included (2), (4), and (6).

Equal numbers of the two forms were randomly distributed within each of the six pilot classes and were administered by the classroom teachers. The researcher observed all administrations of the pilot forms.

For each of the pilot tasks, a master list of all subjects' responses (representing different solution approaches) including frequency counts was prepared. Categories of responses were identified within the master list. Those categories that were infrequently used and that were judged to be both imaginative and clever or promising were noted as categories to be credited for an originality score. This work was carried out by the researcher and two research assistants working together but on different tasks. The final definition of categories and selection of categories to be credited for originality had to be agreed upon by all three individuals. Discussion was conducted until consensus was reached. The protocols thus developed were used by the researcher to score all pilot SRP's submitted. (All pilot SRP's submitted were used in the development of protocols, i.e., approximately 70 per form.)

The Pilot SRP's were scored for:

(1)Fluency: one point for each non-redundant idea;
(2)Flexibility: one point for each category used; and
(3)Originality: one point for each response belonging to an "originality" category. Descriptive statistics for the pilot tasks are presented in Table 3.1.

Tasks (1), (3), and (6) were selected as tasks for the final form of the SRP. These were the only tasks that evoked responses that were judged to qualify as both imaginative and clever or promising. The SRP in its final form is included as Appendix F.

Table 1 - Means, Standard Deviations, and Ranges for the Pilot SRP Tasks

Variable	Task	Mean	S.D.	Min	Max
Fluency	(1)	5.92	3.34	2	16
	(2)	4.36	2.77	0	17
	(3)	3.79	2.17	0	10
	(4)	5.90	3.43	0	21
	(5)	4.49	3.33	0	15
	(6)	1.96	1.88	0	12
Flexibility	(1)	1.62	.84	1	4
	(2)	2.64	1.29	0	7
	(3)	2.14	.94	0	4
	(4)	2.26	.86	0	4
	(5)	2.17	1.20	0	5
	(6)	1.40	1.02	0	5
Originality	(1)	.36	.60	0	2
	(2)	---	---		
	(3)	.27	.45	0	1
	(4)	---	---		
	(5)	---	---		
	(6)	.01	.12	0	1

Notes:
For Form A, tasks: (1), (3), and (5), $\underline{n}$=68.
For Form B, tasks: (2), (4), and (6), $\underline{n}$=70.
For tasks (2), (4), and (5), there were no categories that were judged to qualify for originality credit.

Score Development. To arrive at final scores for an SRP, three main steps were undertaken:

(1)Working from a master list with frequency counts of subjects' responses to each task, a coding system was developed to quantify a large number of qualitative differences among subjects' responses to the tasks.

(2)The following kinds of analyses were undertaken to determine

the meaningfulness of categories defined and scored in step 1 above.

(a)Inter-task correlations were examined to determine whether there was internal consistency among the same or similar categories or types of scores.

(b)Intra-task correlations were examined to determine the appropriateness of combining infrequently used categories.

(c) Correlations between SRP scores and scores on the Proposal activity (the external criterion of creativity in the study) were examined to determine the relevance of scores initially developed for the SRP tasks.

(3)For those scores to be retained for the SRP, as determined in step 2 above, scales were developed to replace the raw scores from each task in order to preserve the weight of each task/category in the final, composite scores.

For a description of the initial coding and scoring system, see Appendix H (i.e., the results of step 1 above). For the correlation matrix of initial SRP scores and the Proposal score, see Appendix I. For the rationales for SRP scores retained/combined for use, see Appendix J (i.e., results of step 2 above). For the scaling system used to compute final SRP scores, see Appendix K (i.e., step 3 as described above).

Reliabilities. To determine inter-scorer reliabilities, 40 SRP's were randomly selected (8 from those scoring 5 or 6 on Proposal; 16 from those scoring 3 to 4.5 on Proposal; and 16 from those scoring 2.5 or less on Proposal) and were scored by a research assistant. These SRP's were also re-scored by the

researcher to determine intra-scorer reliabilities.

3.3.2 Development Of Proposal Activity, Rating Scale, And Scoring

Purpose. The purpose of the Proposal activity was to provide a relatively standardized opportunity for subjects to demonstrate creative thinking in an "everyday world", high-interest situation.

Development of the Proposal Activity. The classroom teachers were consulted to determine high-interest events that each class would be interested in planning and conducting and that teachers would be willing to follow through with during the school year. Events selected to be the focus of the Proposal activity for each class were those which: were of high-interest to the majority of students in the class; provided for some degree of commonality in scope and content across events; and provided scope for creative thought.

As the Proposal activity itself, subjects were to write a set of ideas about the form the event would take. Prior to writing these "Proposals", each class was given a presentation which included: a warm-up activity which provided practice in creative thinking; the list of criteria that the event was expected to meet; background information and ideas related to the event; oral group practice in using creative thinking to generate ideas for the event. The "Request-for-Proposal presentation" is presented in Appendix L. Subjects were given a

30-minute time period to write their Proposals. The following day, an additional 20-minute period was provided.

Development of the Rating Scale. A general method for the development of scales to be used in rating complex products has been illustrated in a large-scale assessment of written expression (Conry, 1978). With the use of this method, rating scales are built to accommodate the number of ability levels that can be meaningfully distinguished among products. Each of the points on a scale is described in terms of the general meaning of the underlying skill dimension. Finally, samples of products are selected to exemplify each of the points. This method for building rating scales appeared to be well-suited to address the measurement problems of rating work-samples for creativity criteria. That is, scales developed in this way could provide for objectivity while facilitating an optimal level of discrimination among products.

The first step in the building of the rating scale was to determine the number of ability levels that could be meaningfully detected among the Proposals. The Proposals from four classes were used for this exercise. It was decided in advance that Proposals would be rated on only one dimension called "creativity", i.e., only one scale would be developed. Examination of Proposals confirmed the feasibility and appropriateness of this plan.

To determine the number of ability levels discernible (i.e, the number of points that would be on the scale) the researcher read the Proposals and sorted them into piles. The first

sorting attempt resulted in the identification of four groups of Proposals. These four groups were initially described in the following general terms: Group 1 - Proposals reveal students' inability or unwillingness to attempt the task; Group 2 - Students have attempted the task without success; Group 3 - Parts or all of the Proposal meet the criteria of novelty; Group 4 - The Proposal ideas are both novel and germinal. (See definition of creativity as a product in Chapter I for Blank's defintion of students' products which are novel and germinal.)

A second sorting exercise was then conducted with only the Proposals in Group 2. This sort resulted in the differentiation of these Proposals into three groups. Thus a total of six scale points were identified by the sorting process.

Each scale point was identified by a general label or description and was defined in terms of both an "anticipated judge's response to Proposals in this category" and a "general description or analysis of Proposals in this category." A figure which lists these labels and descriptions for each of the scale points is included as Appendix M. Two or three examples of students' Proposals were selected to exemplify each of the scale points. These exemplars are included as Appendix P.

Scoring. All Proposals were rated by both the researcher who built the rating scale and by another individual who was given training in the use of the rating scale. The second judge was selected on the basis of expertise in the area of creativity and experience with intermediate grade children.

A total of 209 Proposals were rated by both judges. The

judges gave identical ratings for 136 (65%) of the Proposals. For 51 (24%) of the Proposals, judges' ratings differed by one scale point. For 22 (11%) of the Proposals, judges' rating differed by two scale points.

Where judges' ratings differed by only one scale point, the ratings were averaged to assign a score to the Proposal. Where the ratings differed by two scale points, the Proposals were presented to the judges to be independently rated again. After rating these Proposals the judges discussed Proposals receiving different ratings and attempted to reach consensus. There were 22 Proposals "re-rated" by both judges. For nine (41%) of these, identical ratings were assigned. For 11 (50%), identical ratings were reached through concensus. For two (9%), ratings were left as differing by one point and were averaged.

3.3.3 Development Of Case Studies And Case Study Variables

Purpose. The purpose for developing the case studies was to obtain descriptions of subjects' everyday life behavior/characteristics. As 11 of the 15 case study subjects had demonstrated creative ability on the Proposal activity, the case studies for these subjects could provide for "rich description" of creative individuals at this age level. It was also expected that the case study material might contribute to interpretation of some of the SRP variables.

Method. The development of the case studies was guided by both: awareness of characteristics typically attributed to creative individuals and awareness of characteristics that subjects had revealed/manifested in response to the SRP tasks, i.e., the SRP variables.

To obtain material for the case study preparation, interviews were conducted with the subject, the parents, and the teacher. The interview schedules are included in Appendix N. Interviews with subjects and parents were tape recorded. Hand-written notes were made during interviews with teachers. The subjects were interviewed during the school day in 30-45 minute periods. Teachers were interviewed outside of class time after the subject(s) from their class had been interviewed. Parents were interviewed at their child's school after school hours. For 13 of the 15 subjects, both parents attended the interview. One subject had a single parent. Interviews with parents took approximately one hour.

Tapes of interviews were transcribed into hand-written form by the researcher. The case studies were then written in the following manner. The transcripts and notes for a subject were read several times to determine the most distinctive and pervasive characteristics of that subject. Once these main characteristics were identified, all statements related to a main characteristic were grouped together to form a subsection of the case study. Accordingly, the case studies do not have identical subheadings. The case studies are included as Appendix O.

Scoring. The scoring or classification system developed for the case studies was an attempt to quantify discernible differences among the case studies. Eight characteristics were identified as variables or dimensions to be used for classification purposes. These were: (1)use of willpower; (2)use of prayer; (3)use of wishing; (4)use of fantasy; (5)inclination to wonder; (6)use of humor; (7)success with friends; (8)success with parents.

In order to generate rules for classifying case studies as high, medium, or low on each of these characteristics, the following steps were undertaken. For each characteristic, all case studies were read and indicators of the characteristic or its absence were recorded. From examination of these "indicators", an operational definition was developed for high, medium, or low classification on the characteristic. Cases were then classified according to the operational definitions. The adequacy of the operational definitions were then examined by considering whether each subject's assigned classification was consistent with all information available in his/her case study. If not, the operational definitions were expanded or refined to yield a more satisfactory classification system. The rules used for scoring the case studies on the eight characteristics are presented in Appendix P.

3.4 Study Procedures And Timeline

Figure 1 outlines the timeline for the study activites that were carried out. With the exception of the CTBS, all paper and pencil activities used to collect study data were administered between October 5 - 30, 1981. CTBS results from the previous spring administration were used. The order of instrument administration was: the self-concept questionnaire; tasks from the TTCT; SRP; and Proposal activity. The SRP was administered on the same day in all classes. Teachers were requested to administer the self-concept questionnaire and the TTCT tasks during a specified week for each, choosing a day when class attendence was good. The case study interviews were conducted approximately three months after these data were collected.

Classroom teachers administered the self-concept questionnaire, the TTCT tasks, and the SRP. The researcher made the Request-for-Proposal presentation to each of the classes. The researcher and a school district staff member were the two judges to rate all Proposals submitted by subjects. All case study interviews were conducted by the researcher.

Figure 1 - Timeline for Study Activities

1981	
June 22	Orientation meeting with teachers, principals and school district staff
Sept. 28	Training session with teachers
Sept. 29 - Oct. 22	Construction of SRP - Administration of "What's a Real Problem?" Questionnaire - Selection of Pilot SRP tasks - Administration of pilot tasks - Development of scoring protocols - Scoring of pilot tasks - Analysis of scores - Selection of tasks for final form of SRP
Oct. 5 - 9	Administration of self-concept questionnaire
Oct. 12 - 16	Administration of Torrance tasks
Oct. 26	Administration of SRP
Oct. 5 - 26	Development of Request-for-Proposal presentations
Oct. 27 - 29	Administration of Proposal activity
Nov. 2 - 12	Building of rating scale for Proposals
Nov. 17 & 28	Rating of Proposals
Nov. 23 - Dec. 18	Development of SRP scoring protocols and SRP variables
Dec. 9	Piloting of interview schedules
1982	
Jan. 12	Selection of subjects for case studies
Jan. 27 - Feb. 5	Conduct of interviews for case studies
Feb. 8 - March 18	Preparation of case studies and development of case study variables

IV. ANALYSES AND RESULTS

4.1 Introduction

This chapter begins with the presentation of test characteristics of the main study variables: means and standard deviations (Table 2); frequency distributions (Tables 3 and 4); and reliabilities (Table 5). Test characteristics of the case study variables are presented in the section which pertains to analyses involving these variables (Section 4.4). All variables are treated as interval in the use of parametric statistics in the analyses presented (Gardner, 1975).

4.1.1 Research Questions Addressed In The Analyses

This chapter is divided into sections with each section addressing a general question. Analyses are presented together with the results as the structure of each analysis is frequently dependent upon the results of a previous analysis. The research questions addressed by the sections in this chapter are:

i. What are the relationships betweeen the SRP variables and the Torrance variables?

ii. What are the relationships among Proposal, CTBS, SRP and Torrance variables?

iii. What are the relationships among Proposal, SRP, and the case study variables?

iv. What are the relationships between Self-Concept and the other study variables?

v. What are the relationships between Sex and the other

study variables?

4.1.2 Samples

For questions (i), (ii), and (v) above, the sample included 151 subjects from 9 classes in seven schools. These were subjects whose scores were available for all of: Torrance tasks, SRP, CTBS, and Proposal. One class of students from an eighth school was excluded because, in their case, the administration procedures for the Torrance tasks were not correctly followed. Descriptive statistics presented for TTCT tasks, CTBS, SRP, and Proposal are those computed from the sample of 151. For Proposal, the frequency distributions are presented for both the sample of 151 as well as for the sample of all Proposals submitted (n=225). For SRP, the descriptive statistics for all SRP's submitted (n=242) are presented in Appendix K.

From these 151 subjects, 141 constituted the sample for question (iv) above (i.e., ten subjects whose scores were not available for Self-Concept were excluded). Test characteristics presented for Self-Concept are those that were computed from all questionnaires submitted (n=242).

The case study sample for question (iii) included 15 subjects. Fourteen of these were from the main study sample of 151. One of these 15 subjects was not included in the main study sample of 151 because of missing scores on the Torrance tasks.

For question (ii), the main study sample of 151 is divided

into two subgroups: Noncreative (n=141) and Creative (n=10). Creative Group subjects were defined as those obtaining a Proposal rating of 5 or 6. (Proposal was the name of the activity where subjects submitted a written plan/suggestion for a party or fund-raising event. These "proposals" were products that were judged for creativity on a scale of 1 to 6.) For question (iii), the case study sample included a Creative Group with n=11. One of these Creative Group subjects was excluded from the main study sample of 151 because of missing scores for the Torrance tasks. The frequency distributions for Proposal scores (Table 4) indicates 13 subjects meeting the criteria for Creative Group membership. One of these subjects was excluded from main and case study samples because of missing scores for the SRP. The other was excluded from the main study sample because of missing scores for CTBS and from the case study sample because of lack of parent permission for participation.

4.1.3 Overview Of Analyses And Results

For the analyses, there was a common set of study data for 151 subjects. That included the seven SRP variables, the Proposal score, seven variables from the TTCT, the composite score from the CTBS, and a Self-concept score.

The first step in the analyses was to look at the correlations between the SRP variables and the TTCT variables. SRP Fluency and Flexibility were significantly, positively correlated with all but two of the seven TTCT variables. SRP Analytic Thinking was significantly, positively correlated with three of the TTCT figural variables.

Overall, significant correlations between SRP and TTCT variables tended to be as high as correlations among Torrance variables themselves. This suggested that Torrance tasks and SRP tasks were measuring something that was common. However, further analyses suggested that what was common to them was general ability as measured by academic achievement rather than creativity. There was convergence among SRP, TTCT, and CTBS variables. However, none of the TTCT variables were significantly correlated with Proposal, the external criterion of creativity.

The next analysis step was to determine which of the SRP variables were the most efficient predictors of performance on Proposal. Five of the SRP variables were significantly correlated with Proposal. However, four of these were significantly correlated among themselves. At the same time, CTBS was significantly correlated with Proposal and with some of the SRP variables. Therefore, there was also the question of how much SRP variables added to the prediction of Proposal given the availability of academic achievement scores.

Two stepwise regression analyses were conducted. When only SRP variables were used to predict Proposal, Flexibility and Conceptual Thinking were selected. When CTBS was also used, Flexibility and Conceptual Thinking remained in the equation but their contribution was not substantial. Thus, general ability as indicated by academic achievement seemed to be the great leveller in predicting to the full range of performance on Proposal.

The next analysis question was concerned with discriminating the Creative Group. These were the ten subjects who had gotten a "5" or a "6" on the Proposal rating. Conceptual Thinking and Analytic Thinking were the most powerful discriminators for this purpose. When CTBS was forced to be included in the stepwise discriminant analysis, it had little power, even as the first variable entered.

In summary, Flexibility and CTBS were the best single predictors of Proposal scores. As discriminators of the Creative Group, Conceptual Thinking and Analytic Thinking were best.

Case studies were developed for 15 subjects and were quantified into eight variables. These eight variables were included in convergence analyses with the SRP variables and Proposal. It was hoped that any strong patterns that emerged might clarify interpretations of the SRP variables.

Both of the case study variables, Wonder and Friends were significantly correlated with Proposal. The Wonder variable was a score for the inclination to wonder about the complex or abstract. The Friends variable was a score for psycho-social talent. To examine which of these variables might be more necessary or sufficient for performance on Proposal, patterns in the raw data were inspected.

It appeared that the Wonder variable was more necessary and sufficient for performance on Proposal. The raw data were strongly suggestive about interpretations for the Conceptual Thinking variable. Conceptual Thinking, in the case study

sample, represented he joint presence of strengths on both the Wonder variable and the Friends variable. Only subjects who had high scores on both these variables had a score for Conceptual Thinking. Only subjects from this group had the highest score of "6" for Proposal.

Table 2 - Means, Standard Deviations, and Ranges for Study Variables*

Variable	Mean	Standard Deviation	Range
Torrance			
Verbal Fluency	13.53	6.58	33
Verbal Flexibility	5.56	2.13	11
Figural Fluency 1	8.38	2.15	8
Figural Fluency 2	15.58	6.45	32
Figural Originality 1	4.80	1.99	9
Figural Originality 2	4.54	3.15	15
Creative Strengths	4.05	2.18	12
SRP			
Fluency	7.95	2.81	12
Flexibility	8.94	2.91	15
Wishing	.36	.67	3
Personal Capability	1.23	1.35	5
Fantasy Factor	.64	1.16	6
Analytic	.42	.64	3
Conceptual	.13	.41	2
Proposal	2.90	1.17	5
CTBS	5.21	.93	3.9
Self-Concept	193.00	39.55	176
Age**	124.34	5.85	27
Sex***			

N=242 for Self-Concept.
N=151 for all other variables.
*Descriptive statistics for case study variables are presented in Table 17 and 18.
**For age, units are in months.
***There were 66 boys and 85 girls.

Table 3 - Percentage Frequency Distributions of Scores for Five of the SRP Variables

Variable	Score	% of Subjects N=151	% of Subjects N=242
Wishing	0	73.5	76.4
	1	18.5	17.4
	2	6.6	5.0
	3	1.3	1.2
Personal Capability	0	41.1	48.0
	1	23.2	22.0
	2	17.9	16.0
	3	9.3	7.0
	4	6.6	5.0
	5	2.0	2.0
Fantasy Factor	0	66.2	66.5
	1	17.9	16.9
	2	8.6	8.7
	3	4.0	4.1
	4	1.3	1.7
	5	.7	1.2
	6	1.3	.8
Analytic	0	64.9	67.0
	1	28.5	26.0
	2	6.0	6.0
	3	.7	.4
Conceptual	0	89.4	93.0
	1	7.9	5.0
	2	2.6	2.0

Table 4 - Frequency Distributions of Scores for the Proposal Variable

Variable	Score	n=151 N	n=151 %	n=224 N	n=224 %
Proposal	1	11	7.3	16	7.1
	1.5	8	5.3	12	5.4
	2	44	29.1	69	30.8
	2.5	14	9.3	22	9.8
	3	16	10.6	22	9.8
	3.5	11	7.3	17	7.6
	4	34	22.5	49	21.9
	4.5	3	2.0	4	1.8
	5	7	4.6	10	4.5
	6	3	2.0	3	1.3

Table 5 - Inter-scorer and Intra-scorer Reliabilities for the Proposal and SRP Variables

Variable	Inter-scorer	Intra-scorer
SRP		
Fluency	.93	.98
Flexibility	.91	.97
Wishing	1.00	1.00
Capable	.95	1.00
Fantasy Factor	1.00	1.00
Analytic	.89	.92
Conceptual	.90	.90
Proposal	.88*	

Note.
*Both judges awarded identical ratings to 77.8% of the proposals. On the remaining proposals, judges' ratings differed by one scale point. For these cases, the average of the two ratings was the final score assignd to a proposal.

4.2 Relationships Between The SRP Variables And The Torrance Variables

Intercorrelations among the Torrance variables are presented in Table 6. Intercorrelations among the SRP variables are presented in Table 7. Correlations between the SRP variables and the Torrance variables are presented in Table 8.

Three of the SRP variables -- Fluency, Flexibility, and Analytic Thinking -- were significantly, positively correlated with variables from the Torrance tasks. Overall, the significant correlations between SRP and Torrance variables tended to be of the same magnitude as significant correlations among Torrance variables (excluding intra-task variables).

Table 6 - Pearson Product-Moment Intercorrelations Among Variables from the Torrance Tests of Creative Thinking (N=151)

	VFlu	VFlex	F1Flu	F2Flu	F1Orig	F2Orig	CS
VFlu							
VFlex	59**						
F1Flu	14	01					
F2Flu	26**	18	32**				
F1Orig	13	10	54**	10			
F2Orig	20*	14	13	53**	00		
CS	31**	20*	10	31**	09	26**	

Notes:
Leading decimals omitted.
*$p<.01$.
**$p<.001$.

Table 7 - Pearson Product-Moment Intercorrelations Among SRP Variables (N=151)

	Flu	Flex	Wish	Capable	Fant F	Analytic
Flu						
Flex	79**					
Wish	24*	19				
Capable	47**	27**	02			
Fant F	15	01	02	07		
Analytic	43**	45**	06	29**	-16	
Concept	14	07	07	14	20*	19*

Notes:
Leading decimals omitted.
*$p<.01$.
**$p<.001$.

Table 8 - Pearson Product-Moment Intercorrelations Among SRP and Torrance Variables (N=151)

	Torrance						
SRP	VFlu	VFlex	F1Flu	F2Flu	F1Orig	F2Orig	CS
Flu	24*	26**	13	30**	23*	19*	15
Flex	21*	22*	08	30**	20*	22*	13
Wish	05	16	15	05	09	02	-02
Capable	-01	-04	-09	03	06	07	02
Fant F	08	12	10	-04	06	-07	02
Analytic	03	01	07	22**	26**	29**	01
Concept	01	04	12	06	10	04	14

Notes:
Leading decimals omitted.
*p<.01.
**p<.001.

Both SRP Fluency and Flexibility were significantly correlated with the Torrance variables: Verbal Fluency, Verbal Flexibility, Figural Task 2 Fluency, Figural Task 1 Originality and Figural Task 2 Originality. Of these, the highest correlations were with the Torrance variable, Figural Task 2 Fluency, rather than with the Torrance verbal variables. This may be due to the more qualitative nature of the figural measure (i.e., if the examinee's idea doesn't work very well he/she probably can't draw it and therefore can't get a score for it. By contrast, examinees may or may not exercise evaluative thinking on the verbal task.)

The SRP variable, Analytic Thinking, correlated significantly with the Torrance variables: Figural Task 1 Originality, Figural Task 2 Fluency, and Figural Task 2 Originality. It did not correlate significantly with the Torrance verbal variables. It demonstrated higher correlations with the figural originality variables than with the figural fluency variable. Its correlations with the figural originality variables were higher than were those of SRP Fluency or Flexibility. This is particularly noteworthy given the lesser degree of variability for the Analytic Thinking variable (see Table 3). It is also notable that the Analytic Thinking variable correlated significantly with both Torrance figural originality variables while the latter exhibited a zero correlation with each other.

None of the SRP variables correlated significantly with the Torrance variable, Figural Task 1 Fluency. However, neither did the Torrance verbal variables correlate with it significantly. Since Figural Task1 Fluency did correlate significantly with Figural Task 2 Fluency, it may be that there is a high degree of figural domain specificity for this variable.

None of the SRP variables correlated significantly with the Torrance variable, Creative Strengths. Among the Torrance variables, Creative Strengths correlated significantly with the verbal task and the second figural task variables but not with the first figural task variables. This again points up the uniqueness of the first figural task since the Creative Strengths score was developed from responses to both figural

tasks.

Overall, the correlations suggest that the SRP variables, Fluency, Flexibility and Analytic Thinking, shared as much, if not more variance with the Torrance variables than the latter did inter-taskwise among themselves. SRP Analytic Thinking appears to be related most strongly to Torrance figural originality. SRP Fluency and Flexibility appear to be related to all Torrance variables except Figural Task 1 Fluency and Creative Strengths.

4.3 The Relationships Of Proposal And CTBS With SRP And Torrance Variables

Table 9 presents the correlations between Proposal (i.e., score on the product measure of creativity) and CTBS and the SRP and Torrance variables).

None of the Torrance variables were significantly correlated with Proposal. Figural Task 2 Originality exhibited the highest correlation with Proposal. Three of the Torrance variables were significantly, positively correlated with CTBS: Verbal Fluency, Verbal Flexibility, and Creative Strengths.

Five of the SRP variables were significantly, positively correlated with Proposal: Fluency, Flexibility, Personal Capability, Analytic Thinking, and Conceptual Thinking. Of these, Flexibility had the highest correlation with Proposal. Three of the SRP variables correlated significantly with CTBS: Fluency, Flexibility, and Personal Capability. Personal

Capability had the highest correlation with CTBS.

Proposal and CTBS exhibited a higher correlation with each other than with any of the SRP or Torrance variables.

Table 9 - Pearson Product-Moment Correlations of CTBS and Proposal with SRP and Torrance Variables (N=151)

	Proposal	CTBS
Torrance		
VFlu	04	28**
VFlex	06	26**
F1Flu	-09	-17
F2Flu	00	05
F1Orig	01	01
F2Orig	18	14
CS	05	23*
SRP		
Flu	26**	30**
Flex	35**	33**
Wish	08	-09
Capable	24*	36**
Fantasy Factor	-08	08
Analytic	28**	19
Conceptual	23*	16
CTBS	46**	

Notes:
Leading decimals omitted.
*p<.01.
**p<.001.

It is clear that the Torrance variables offered little predictive validity for the Proposal variable since none of the Torrance-Proposal correlations were significant.

Five of the SRP variables were significantly correlated with Proposal, but three of these variables were also significantly correlated with CTBS. As well, the SRP variables were significantly correlated among themselves (see Table 4.5). In untangling this mosaic, four questions were of interest.

1. What subset of the SRP variables provides for the most efficient prediction of the Proposal variable?
2. Given the availability of the CTBS variable, what further

contribution do SRP variables make to the prediction of Proposal scores?

3. Which SRP variables have the most discriminating power for predicting Creative Group membership (i.e., the subset of subjects obtaining a Proposal rating of 5 or 6)?

4. Given the availability of CTBS, what is the contribution of SRP variables to discriminating between the Noncreative and the Creative Group?

4.3.1 SRP And Proposal Regression Analysis

In order to investigate which SRP variable or combination of SRP variables would be the most efficient predictors of the Proposal variable, a multiple stepwise regression equation was developed using SRP variables (those significantly correlated with Proposal) as independent variables to predict to the Proposal variable. This provided for a ratio of 30 subjects per independent variable (which is desirable to derive a 'stable' equation, Kerlinger & Pedhazur, 1973). The probability level of .05 for entry and .10 for deletion of a variable into/from the regression equation was set in order to select a parsimonious subset of variables. The increment of explained variance (R^2) associated with the independent variables was reported as an indication of the relative contribution of the SRP variables to the explained variance in the Proposal variable. The two stepwise regression analyses presented in this chapter were carried out using the New Regression procedure from the Statistical Package for the Social Sciences (SPSS) (Kita, 1981).

A summary of the stepwise regression equation based on the Proposal and SRP variables is presented in Table 10. The equation generated indicates that Flexibility was the most efficient predictor of Proposal. In addition, Conceptual Thinking contributed significantly to the prediction of Proposal (after the variance shared with Flexibility had been removed). However, the proportion of additional variance (R^2) predicted in Proposal by Conceptual Thinking was small in comparison to the amount of variance already predicted by Flexibility (so small that it cannot be considered a meaningful contribution). None of the variables -- Fluency, Personal Capability, or Analytic Thinking -- contributed significantly to the prediction of Proposal after the variance shared with Flexibility and Conceptual Thinking had been removed.

Table 10 - Stepwise Regression Analysis I: Proposal and SRP Variables

SRP Variables

Equation I Dependent Variable: Proposal n=151		
p to enter=.05 p to delete=.10	R^2=.16	F Probability=.0000
Variables Entered		**Increment in R^2**
Flexibility		.12
Conceptual		.04
Variables Remaining		**F-probability**
Fluency		.54
Capable		.10
Analytic		.18

It appears that subjects' obtained Flexibility and Conceptual Thinking scores on the SRP are related beyond chance level to their obtained rating on the Proposal measure and that these two SRP variables comprise a parsimonious subset of all the SRP variables. (The remaining SRP variables are Fluency, Wishing, Personal Capability, Fantasy Factor, and Analytic Thinking.) The results of Equation I suggested that the remaining SRP variables did not improve significantly the accuracy of predicting Proposal ratings compared to the prediction based only on Flexibility and Conceptual Thinking. It should be noted, however, that the magnitude of the prediction (R^2) is small. This equation was developed for the purpose of exploration, not explanation, therefore interpretations regarding it are not offered at this point.

4.3.2 SRP, CTBS, And Proposal Regression Analysis

To determine whether SRP variables make a significant contribution to the prediction of Proposal that is unaccounted for by CTBS, a second stepwise regression equation was developed. Independent variables used in the equation were: CTBS, Flexibility, and Conceptual Thinking (the two SRP variables identified by Equation I as a parsimonious subset of SRP variables).

A summary of the stepwise regression equation based on the Proposal, CTBS, and SRP variables is presented in Table 11. The equation generated indicates that both Flexibility and Conceptual Thinking contributed significantly to the prediction

of Proposal (after the variance shared with CTBS had been removed). The amount of additional explained variance (R^2), however, is small (too small to be considered meaningful.) This suggests that to a small extent, but above a chance level, each of these SRP variables provides information that is independent from CTBS scores and that is relevant to performance on the Proposal measure. It also indicates that there is considerable overlap in the variance that each of the variables, CTBS and Flexibility share with Proposal.

Table 11 - Stepwise Regression Analysis II: Proposal, CTBS and SRP Variables

CTBS and SRP Variables

Equation II Dependent Variable: Proposal n=151		
p to enter=.05 p to delete=.10	R^2=.27	F Probability=.0000
Variables Entered		Increment in R^2
CTBS		.21
Flexibility		.04
Conceptual		.02

4.3.3 SRP And Proposal Discriminant Function Analysis

The Creative Group (n=10) was defined as those subjects having Proposal ratings of either five or six. For the full range of Proposal scores, Flexibility and Conceptual Thinking had been the most efficient SRP predictor variables. A stepwise discriminant function analysis was employed to determine which of the SRP variables were most useful for predicting membership in the Creative Group. The seven SRP variables formed the set of predictors. The means and standard deviations for the predictor variables in each of the groups are presented in Table 12. In order to obtain a parsimonious solution, only those variables that contributed significantly to the discrimination between the two groups were retained (p to enter = .05; p to delete = .10). The prior probabilities of group membership for classification purposes were set proportional to the observed number of subjects in each group. The discriminant analyses reported in this chapter were carried out using the subprogram DISC from SPSS (Kita, 1979). The results of the analyses are reported in Tables 13 and 14.

Table 13 shows the variables selected in their order of discriminatory power. The value of Wilk's lambda is presented for each step. Conceptual Thinking provided the greatest discriminatory power. The next most powerful discriminator, given Conceptual Thinking was Analytic Thinking. Beyond the second step, no variables exhibited a large enough partial multivariate F ratio to be considered for selection. It should be noted, however, that the reduction in Wilk's lambda by the

variables selected was not substantial.

Table 14 contains the standardized discriminant function coefficients for the selected variables on the discriminant function. These coefficients indicate that Conceptual Thinking contributed most to differentiation along the function. The eigenvalue and canonical correlation corresponding to the function are also reported. These are not large in magnitude. The function, however, contributed significantly to the discrimination between groups. The contribution of the function to the separation of the two groups can be seen from examination of the group centroids presented in the table.

Table 12 - Number, Prior Probability and Means and Standard Deviations of Predictor Variables for Each Criterion Group

	Group	
	Noncreative	Creative
Number	N=141	N=10
Prior Probability	.93	.07
Fluency	7.79 (2.76)*	10.30 (2.58)
Flexibility	8.76 (2.85)	11.50 (2.55)
Wish	.37 (.68)	.20 (.42)
Capable	1.18 (1.30)	2.00 (1.89)
Fantasy Factor	.63 (1.15)	.70 (1.34)
Analytic	.37 (.57)	1.20 (1.03)
Conceptual	.09 (.33)	.80 (.79)
CTBS	51.60 (9.30)	59.70 (5.19)

Notes.
The table includes predictor variables from both discriminant analyses in the chapter.
*Numbers in parentheses are standard deviations.

Table 13 - Stepwise Discriminant Analysis I: Using SRP Variables to Separate Creative and Noncreative Groups

SRP Variables

Two Groups: Noncreative (n=141) and Creative (n=10)

Order of Entry of Variables
p to enter=.05 p to delete=.10

Step No.	Independent Variable	Wilk's Lambda
1	Conceptual Thinking	.81
2	Analytic Thinking	.75

Variables Remaining	F-probability
Fluency	.35
Flexibility	.14
Wishing	.14
Capable	.69
Fantasy Factor	.69

Table 14 - Summary Statistics for Discriminant Analysis I

SRP Variables

Independent Variable	Standardized Discriminant Function Coefficients
Conceptual Thinking	.80
Analytic Thinking	.55
Eigenvalue	.33
Canonical Correlation	.50

Canonical Discriminant Function evaluated at group means (group centroids)

Group	Function 1 (Significance=.0000)
Noncreative	-0.15
Creative	2.15

The adequacy of the derived discriminant function was further assessed by applying the discriminant function to subjects used to derive the function and comparing predicted group membership with actual group membership. The classifications were adjusted based on prior probabilites proportional to group size. Only four of the ten subjects in the Creative Group were correctly classified. These results indicate that while Conceptual Thinking and Analytic Thinking were the SRP variables that were most relevant to Creative Group membership, they were not adequate for correctly classifying a large proportion of the Creative Group.

In reviewing the results of this discriminant analysis (Tables 13 and 14) and the regression analyses (Tables 10 and 11), the following observations can be made. In accounting for the full range of performance on the Proposal measure, CTBS and SRP Flexibility were the most efficient single predictors. Among the SRP variables, only Flexibility and Conceptual Thinking contributed significantly to the prediction of Proposal ratings. By contrast, in predicting to membership in the Creative Group, Conceptual Thinking and Analytic Thinking were the only SRP variables to make significant contributions to a discriminant function.

4.3.4 CTBS, SRP And Proposal Discriminant Function Analysis

To clarify the contribution that CTBS can make to predicting Creative Group membership, another multiple linear discriminant analysis was employed. CTBS and the SRP variables, Conceptual Thinking and Analytic Thinking, were used as predictors. Using a stepwise procedure, CTBS was forced to enter first if it met the selection criteria ($p<.05$ to enter and $p<.10$ to delete.) The results of the analysis are reported in Tables 15 and 16.

Table 15 shows the order of variables selected and the consequent reduction in Wilk's lambda with the entry of each variable. Both Conceptual Thinking and Analytic Thinking were selected after CTBS was forced to enter first. This indicates that both the SRP variables made significant contributions to the discriminant function beyond that provided by CTBS. Even though it was entered first, the reduction in Wilk's lambda resulting from the entry of CTBS was small.

Table 16 contains the standardized discriminant function coefficients for the selected variables. These coefficients indicate that Conceptual Thinking contributed most to differentiation along the function and CTBS contributed least. The eigenvalue and canonical correlation corresponding to the function are also reported. These are almost the same as those reported in Table 14 for the SRP variables alone. The group centroids are also presented in Table 16. A comparison of group centroids in Tables 14 and 16 shows that the inclusion of CTBS did not result in substantially greater separation of the two

groups.

Table 15 - Stepwise Discriminant Analysis II: Using CTBS and SRP Variables to Separate Creative and Noncreative Groups

CTBS and SRP Variables

Two Groups: Noncreative (n=141) and Creative (n=10)

Order of Entry of Variables
p to enter=.05 p to delete=.10

Step No.	Independent Variable	Wilk's Lambda
1	CTBS*	.95
2	Conceptual Thinking	.79
3	Analytic Thinking	.74

Note.
*CTBS was forced to enter first if it could meet the selection criteria.

Table 16 - Summary Statistics for Discriminant Analysis II

CTBS and SRP Variables

Independent Variable	Standardized Discriminant Function Coefficients
CTBS	.25
Conceptual Thinking	.76
Analytic Thinking	.50
Eigenvalue	.35
Canonical Correlation	.51

Canonical Discriminant Function evaluated at group means (group centroids)

Group	Function 1 (Significance=.0000)
Noncreative	-0.16
Creative	2.22

To further compare the adequacy of this derived discriminant function with that from only the SRP variables, predicted group membership was compared with actual group membership. Again only four of the ten subjects in the Creative Group were correctly classified.

The results of the discriminant analysis utilizing both CTBS and SRP variables indicate that CTBS contributed little to the discrimination provided for by the SRP variables alone. Further, the small reduction in Wilk's lambda due to CTBS alone (see Table 15) suggests that CTBS, on its own, would have little discriminating power. While the SRP variables, Conceptual Thinking and Analytic Thinking, are not adequate to provide for correct classification of a large proportion of the Creative Group, they are the best discriminators from the variables available in the study.

4.4 Relationship Of Case Study Variables With Proposal And SRP Variables

The 15 case study subjects were from six classrooms located in six different schools. The case study sample included Creative Group members (those subjects whose Proposal rating had been a five or a six) for whom SRP results were available (n=11). Also included were three subjects with a Proposal rating of 4.5. The fifteenth case study subject had a Proposal rating of four.

Selection of case study subjects on the basis of highest Proposal ratings had provided for a considerable degree of

variability among SRP scores obtained by members of this group. Two levels of Proposal performance existed within the Creative Group, i.e., ratings=5 or ratings=6. The subjects with a Proposal rating of 4.5 were included in the case study sample since the cut-off score of Proposal rating=5 for Creative Group membership was an arbitrary one (considering error of measurement.) The subject with a Proposal rating=4 was included because there was room for one more subject in the case study sample interview schedule. The subject selected was one who, like the Creative Group members, tended to have above average scores on the SRP variables.

The case studies have been included in Appendix O. They are presented for the interest of the reader rather than as evidence of the children's creativity.

Pearson product-moment correlation coefficients were computed in order to determine the extent of convergence among the case study variables, Proposal, and SRP variables. (For methods used to develop case study variables, see Section 3.3.3. For rules for scoring the case studies on these variables see Appendix P.)

Tables 17 and 18 present the means, standard deviations, and frequency distributions for the Proposal and SRP variables and for the case study variables. Tables 19 and 20 present intercorrelations among the SRP variables and among the case study variables respectively. Tables 21 and 22 present correlations between case study variables and CTBS, Proposal, Self-Concept, and SRP variables. Ordinarily, one would not

discuss correlation coefficients in the tables presented here unless they were significant at the .001 level (since five percent of these correlation coefficients would be expected to be significant by chance alone). However, given the exploratory nature of the study and the large number of variables developed from each of the SRP and the case studies, correlation coefficients significant at the .01 level will be "taken seriously" for the purpose of exploratory examination and discussion.

From examination of intercorrelations among case study variables and the Proposal and SRP variables (Tables 21 and 22), the following observations can be made. Each of the case study variables -- Wonder, Friends, and Total -- were significantly, positively correlated with both Proposal and the SRP variable, Conceptual Thinking. The case study variable, Friends, was also significantly correlated with the two SRP variables: Personal Capability and Analytic Thinking.

Table 17 - Means, Standard Deviations, and Ranges for SRP, Proposal, and Case Study Variables (N=15)

Variable	Mean	S.D.	Min	Max
SRP				
Fluency	9.60	2.53	6	13
Flexibility	11.00	2.20	7	17
Wishing	.47	.83	0	3
Capable	1.67	1.63	0	5
Fantasy Factor	.53	1.13	0	4
Analytic	1.00	1.00	0	3
Conceptual	.53	.74	0	2
Case Study				
Willpower	2.40	.83	1	3
Prayer	2.20	.86	1	3
Wishing	2.13	.74	1	3
Fantasy	1.60	.51	1	2
Wonder	2.13	.83	1	3
Humor	2.20	.77	1	3
Friends	1.67	.82	1	3
Parents	1.67	.49	1	2
Total	16.00	2.78	11	20
Proposal	5.03	.58	4.5	6

Table 18 - Frequency Distributions for Five SRP Variables, Proposal, and Case Study Variables for the Case Study Sample (N=15)

Variable	Score	N	Variable	Score	N
SRP			Case Study		
Wishing	0	10	Willpower	1	3
	1	4		2	3
	3	1		3	9
Capable	0	4	Prayer	1	4
	1	5		2	4
	2	2		3	7
	3	1			
	4	2	Wishing	1	3
	5	1		2	7
				3	5
Fantasy Factor	0	11			
	1	2	Fantasy	1	6
	2	1		2	9
	4	1			
			Wonder	1	4
Analytic	0	6		2	5
	1	4		3	6
	2	4			
	3	1	Humor	1	3
				2	6
Conceptual	0	9		3	6
	1	4			
	2	2	Friends	1	8
				2	4
Proposal	4	1		3	3
	4.5	3			
	5	8	Parents	1	5
	6	3		2	10

Table 19 - Pearson Product-Moment Intercorrelations Among SRP Variables for the Case Study Sample (N=15)

	Flu	Flex	Wish	Capable	Fant F	Analytic
Flu						
Flex	61*					
Wish	23	-12				
Capable	69*	38	17			
Fant F	-40	-58	-21	-17		
Analytic	65*	62*	00	61*	-38	
Concept	39	13	03	51	32	29

Notes:
Leading decimals omitted.
*p<.01.

Table 20 - Pearson Product-Moment Intercorrelations Among Case Study Variables (N=15)

	Willpwr	Prayer	Wish	Fantasy	Wonder	Humor
Willpwr						
Prayer	-02					
Wish	-20	-04				
Fantasy	41	-46	-23			
Wonder	12	-04	20	30		
Humor	42	-28	20	04	18	
Friends	21	00	-04	17	59*	45
Parents	18	-34	-26	29	47	38
Total	56	06	21	30	74**	63*

	Friends	Parents
Parents	42	
Total	76**	47

Notes:
Leading decimals omitted.
*p<.01.
**p<.001.

Table 21 - Pearson Product-Moment Intercorrelations Among Case Study, Proposal, and SRP Variables (N=15)

	SRP						
Case Study	Flu	Flex	Wish	Capable	Fant F	Analytc	Concept
Willpwr	01	-39	02	-11	37	09	21
Prayer	10	26	36	-20	-49	08	16
Wish	-16	04	01	-26	34	-29	-14
Fantasy	09	-32	14	35	40	28	23
Wonder	20	19	-30	30	38	43	68*
Humor	37	08	-04	40	28	09	30
Friends	55	52	-17	61*	13	61*	67*
Parents	29	13	-29	57	09	44	33
Total	39	18	-06	38	37	44	66*
Proposal	08	31	-48	31	35	31	62*

Notes:
Leading decimals omitted.
*p<.01.

Table 22 - Pearson Product-Moment Intercorrelations Between Case Study and Proposal, CTBS, and Self-Concept Variables

Case Study	Proposal	CTBS	Self-Con
Willpwr	-03	07	02
Prayer	-01	-19	-04
Wish	07	-27	-58
Fantasy	05	27	02
Wonder	73*	42	-31
Humor	30	-17	14
Friends	70*	23	-14
Parents	42	46	22
Total	60*	17	-13
N:	15	15	14

Notes:
Leading decimals omitted.
*$p<.01$.

These results indicate that for this case study sample, there is some convergence among Proposal, SRP, and case study variables. The relationship among Wonder, Conceptual Thinking, and Proposal seems somewhat logical. High scores for Wonder were assigned to subjects who reported wondering about things that were abstract, complex, or infinite. Scores for Conceptual Thinking were developed from responses to the war problem which

constitutes a complex problem. The activity of generating the Proposal could also be considered to be complex. Subjects had to write a description of a party or fund-raising event that would meet a number of criteria, e.g., originality, practicality, completeness, relevance. Therefore it could appear to be an attraction to and ability to work with the complex that links together these variables from three independent measures.

The variable, Friends, is significantly, positively correlated with these as well as with the SRP variables, Personal Capability and Analytic Thinking. High-scorers on the Friends variable were those who identified activities with friends as being one of the highest priorities in their life and parents and teachers also commented on the psycho-social talent of these individuals. One can ponder whether the skills reflected in this collection of variables have contributed to their psycho-social success or whether their social activities have contributed to the development of these skills. It is likely that the the social activity and the set of skills have each contributed to the development of the other. however, that such an easily observed characteristic as psycho-social talent appears to be such a relevant indicator of so many other abilities at this age level (at least within a selected sample such as this one.)

The variable, Wonder, on the other hand, while just as strongly related to Proposal and Conceptual Thinking, was not significantly or even moderately related to other SRP variables.

Although Wonder and Friends are significantly correlated with each other, the unexplained variance allows room for the possibility of different "types" of individuals who are all able to perform successfully on the Proposal activity. It also raises the question as to which of these characteristics (i.e., Friends and Wonder) might be necessary or sufficient for successful performance on the Proposal measure.

Inspection of the sets of scores on these three variables (Table 23) suggests the characteristic represented by the Wonder score to be the more necessary and sufficient of two case study variables compared (i.e., Friends and Wonder). It is noteworthy, however, that at the highest level of performance on Proposal, (rating=6), there is a tendency for both Wonder and Friends scores to be high. Given the significant correlations between Friends and the SRP variables, Analytic Thinking and Personal Capability, there is the suggestion of a rich mix of abilities and personality characteristics as being relevant to highest performance on the Proposal measure.

Table 23 - Case Study Subjects' Scores on Proposal and the Case Study Variables: Wonder and Friends

Subject No.	Proposal	Case Study	
		Wonder	Friends
1	6	3	3
2	6	3	3
3	6	3	2
4	5	3	2
5	5	3	2
6	5	2	2
7	5	2	3
8	5	3	1
9	5	2	1
10	5	2	1
11	5	1	1
12	4.5	2	1
13	4.5	1	1
14	4.5	1	1
15	4	1	1

These and the following observations and suggestions are highly speculative and tentative given the use of such a small and selected sample. However, given the opportunity to examine case study data for even these small numbers, it seems appropriate to explore for whatever ideas or speculations might be reasonably gleaned.

To provide for further inspection of the nature of the convergence among variables from Proposal, SRP, and Case Studies, the raw scores for significantly correlated variables are presented in Table 24. The table shows that subjects with high scores for Conceptual Thinking tend to be the only subjects with high scores on the Friends variable. This relatively

clear-cut relationship between Friends and Conceptual Thinking (in conjunction with the Wonder variable) could be expressed as follows. Those subjects who had the inclination to wonder about the complex and who had the playfulness and confidence of the psycho-socially talented, were able and inclined to generate the kinds of responses credited for Conceptual Thinking. These responses (see Appendix H for examples) dealt holistically with the "stop wars" problem (indicating conceptual ability) but at the same time generally showed the examinees to be "playing" with ideas (i.e., responses took the form of fantasy analogies, play-war tactics, or changing the rules or structure of a game . . . in this case, the game of the whole world.)

Expressing the relationship among these scores another way (i.e., among Wonder, Friends, and Conceptual Thinking), the Conceptual Thinking score can be viewed as approximately reflecting the joint presence of strengths on both the Wonder and Friends variables.

Table 24 - Case Study Subjects' Scores on Proposal, Case Study, and SRP Variables

Subject No.	Proposal	Case Study		SRP	
		Wonder	Friends	Concept	Analytic
1	6	3	3	1	2
2	6	3	3	2	2
3	6	3	2	1	0
4	5	3	2	2	2
5	5	3	2	1	0
6	5	2	2	1	1
7	5	2	3	0	3
8	5	3	1	0	2
9	5	2	1	0	1
10	5	2	1	0	0
11	5	1	1	0	1
12	4.5	2	1	0	0
13	4.5	1	1	0	0
14	4.5	1	1	0	0
15	4	1	1	0	1

Inspection of the scores for Creative Group subjects highlights another issue. The first six subjects and the next four or five (Table 24) appear to be different "types" in terms of constellations of strengths portrayed in the table. Each type was able to do well on the Proposal activity. The assumption or expectation underlying discriminant function analysis, however, is that there is a distinguishable homogeneity within the groups to be discriminated. This would be one tentative explanation, at least in part, for the inadequacy of the discriminant function presented earlier in this chapter (i.e., the creative group encompasses two subgroups

having overlapping yet different profiles.)

To complete the examination of the case study analyses, it should be noted that SRP Wishing was not significantly correlated with the case study variables, Wishing or Prayer. The SRP variable, Wishing, represented both wishing and prayer responses on the SRP. Table 25 presents case study subjects' raw scores on these three variables. Those subjects having medium or high scores for case study Wishing or Prayer had not necessarily suggested these strategies as responses to SRP tasks. However, all subjects with SRP Wishing scores greater then zero also had medium or high scores on either Prayer or Wishing from the case studies.

Table 25 - Comparison of Wishing/Prayer Scores from SRP and Case Studies for the Case Study Sample

Subject No.	SRP		Case Study	
	Proposal	Wishing	Wishing	Prayer
1	6	0	3	3
2	6	1	1	3
3	6	0	3	1
4	5	1	2	2
5	5	0	3	2
6	5	0	1	3
7	5	0	2	1
8	5	0	2	3
9	5	0	2	1
10	5	0	2	2
11	5	0	2	3
12	4.5	1	3	2
13	4.5	0	1	1
14	4.5	1	3	3
15	4	3	2	3

The observations and interpretations made have been offered tentatively and are a highly speculative attempt to make sense of patterns and relationships discernible in these data. The numbers in the case study sample were small. Creative Group members were selected for the sample but the constraints of the study did not allow for also including subjects having high scores on Conceptual and Analytic Thinking, but low scores on Proposal. What remains to be accounted for is the difference between these two subgroups of subjects.

4.5 Relationship Of Self-Concept With Study Variables

To determine whether the Self-Concept variable might contribute to interpretation of the study variables, Pearson product-moment correlation coefficients were computed.

Table 26 presents summary statisitics for the Self-Concept variable. Table 27 presents Pearson product-moment correlation coefficients between the Self-Concept variable and each of the other study variables. Self-Concept correlated significantly only with SRP Fluency, Torrance Verbal Fluency, Torrance Figural Task 2 Originality, and CTBS. These correlations were all positive and small in magnitude. Among the case study variables there were no significant correlations with Self-Concept.

Generally, the low and/or non-significant correlations in Table 27 do not suggest any substantial relationship between the Self-Concept variable and any of the study variables.

Table 26 - Summary Statistics for the Self-Concept Variable

Mean	Standard Deviation	Min	Max
193	39.55	92	268

N of Items	Hoyt est. of rel.	Stand. Error of Meas.
63	.96	7.41

Z-score	Lower Bound	Upper Bound
-1.08	148.41	152.92
-0.51	170.97	175.49
-0.05	189.03	193.54
.52	211.59	216.10
.98	229.64	234.15

Table 27 - Pearson Product-Moment Correlations Between Self-Concept and Other Study Variables

Torrance		SRP		Case Study	
VFlu	20*	Flu	21*	Willpower	23
VFlex	14	Flex	16	Prayer	-04
F1Flu	17	Wish	-03	Wish	-58
F2Flu	08	Capable	17	Fantasy	02
F1Orig	09	Fant F	-04	Wonder	-31
F2Orig	20*	Analytic	01	Humor	14
CS	15	Concept	-09	Friends	-14
				Parents	22
Proposal	03	CTBS	22*	Total	-13

Notes.
N=14 for Case Study variables.
N=141 for all other variables.
Leading decimals omitted.
*p<.01.

4.6 Relationship Between Sex And Other Study Variables

Barron and Harrington (1981) have suggested that creativity researchers should routinely include sex differences in reports of their findings. Table 28 presents Pearson product-moment correlation coefficients between Sex and other study variables (except case study variables.) The only significant correlations were with SRP Fluency, Flexibility, and Wishing. All three correlations indicated an advantage for the girls. Among the Creative Group, there were three boys and eight girls. The superior performance of girls is consistent with previous findings that girls return or recover from the "grade four slump" sooner than do boys.

Table 28 - Pearson Product-Moment Correlations Between Sex and Other Study Variables

Torrance		SRP	
VFlu	10	Flu	25*
VFlex	14	Flex	20*
F1Flu	00	Wish	21*
F2Flu	08	Capable	-04
F1Orig	05	Fant F	-09
F2Orig	06	Analytic	-02
CS	08	Concept	-14
Proposal	17	CTBS	-12
Self-Concept	01	Age	04

Notes.
N=141 for Self-Concept variable.
N=151 for all other variables.
Boys were coded as 1 and girls were coded as 2.
Leading decimals omitted.

V. CONCLUSIONS AND DISCUSSION

5.1 Introduction

5.1.1 Purpose Of The Study

The development of Solving Real Problems (SRP) tasks was prompted by the intent to investigate the possibility of designing creative problem solving tasks that would be:

(1)stimulating from the examinee's point of view;

(2)complex;

(3)logically related to creative behavior as it occurs in the examinee's "everyday world";

(4)likely to provide for qualitative indices of originality or creative thinking.

An exploratory approach to the development of scoring protocols for the SRP was utilized in order to provide for the identification of manifestations of creativity that might be idiosyncratic to the age level of subjects in the study or to these kinds of tasks.

It was expected that both ability and personality characteristics should be reflected in an examinee's responses to the SRP. Since SRP tasks were intended to resemble the examinee's own high-interest "everyday world" problems, they were expected to cue the use of the examinee's usual repertoire of abilities and attitudes that are typically engaged in response to such problems.

To assist in interpretation of examinees' performance on SRP tasks, other data utilized included:

(1)performance on selected tasks from the Torrance Tests of Creative Thinking;

(2)results from the Canadian Tests of Basic Skills;

(3)scores on a modification of the Sears-Spaulding Self-Concept Questionnaire;

(4)ratings obtained on Proposals, a novel measure of everyday life creative problem solving performance (see Section 3.3.2);

(5)scores on everyday life behavior/characteristics developed from case studies of selected subjects (n=15). (Subjects classified as creative on the Proposal measure comprised the majority of the case study sample).

5.2 Conclusions

The contribution this study has made to our understanding of the creative child is that on the basis of findings in this study, it appears reasonable to conclude that the creative child is one who is much attracted to complexity and enjoys wondering about things that are abstract. This child puzzles about "why gravity is", "how space can be infinite", "the way numbers make other numbers", "why people behave the way they do", or "how the cycles of nature keep reoccurring". This is the major broad claim that can be made about all "creative children" in the study.

In addition to this predisposition to wonder about complex or abstract phenomena, the creative child also has some or all of the following characteristics. He/she is likely to be very popular and accepted as a leader by friends and classmates. The

child's self-confidence probably shows when she/he has the opportunity to try something difficult. As well, or instead, it may appear as playfulness when the child suggests far-fetched (but metaphorically related) solutions to a problem. In other words, the creative child is characterized by either or both an "I-can-do-it/stick-to-it-iveness" attitude or sparkling, spontaneity of thought.

5.2.1 Interpretation Of SRP Variables

The exploratory development of protocols for scoring the SRP yielded seven dimensions or variables: Fluency, Flexibility, Wishing, Personal Capability, Fantasy Factor, Analytic Thinking, Conceptual Thinking. Relationships among these variables and other data collected were analyzed to determine reasonable interpretations of the meaning of SRP variables. Drawing from the results of these analyses (presented in Chapter IV) the following interpretations of the SRP variables are suggested.

Fluency and Flexibility. Both Fluency and Flexibility would appear, for the most part, to be reflections of general ability, with Flexibility being the more accurate indicator of the two.

Although Fluency and Flexibility were significantly correlated with Torrance Verbal Fluency and Verbal Flexibility, the latter two variables were significantly correlated with CTBS but not with Proposal. Upon initially observing the significant correlations between SRP Fluency and Flexibility and the Torrance variables, it is tempting to conclude that SRP Fluency and Flexibility are measures of divergent thinking just as the

Torrance variables are supposed to be. It is more likely, however, that what is common to these particular SRP and Torrance variables is general intellectual ability (as indicated by CTBS). The SRP variables were significantly correlated with Proposal (the "everyday life" measure of creativity), but the Torrance variables were not.

The use of both CTBS and SRP Flexibility as predictors of Proposal in a stepwise regression analysis (Table 11), showed that considerable overlap existed between CTBS and Flexibility in the variance that each shared with Proposal. When only SRP variables were used as predictors (Table 10), Flexibility rather than Fluency was selected first. Once Flexibility was in the equation, Fluency failed to meet the selection criteria. This indicated that considerable overlap existed between Fluency and Flexibility in the variance that each shared with Proposal.

Wishing. The variable, Wishing, was not significantly correlated with any other variable in the study (except for Sex). Notably, it did not correlate significantly with the case study variable, Wishing. Examination of the raw data for the case study subjects (Table 25) revealed the following pattern. Without exception, if a case study subject had obtained a score greater than zero for Wishing on the SRP, then he/she also reported the use of wishing or prayer when interviewed. However, not all subjects who reported using wishing or prayer had also made wish or prayer responses on the SRP. In other words, if one uses SRP Wishing scores to predict to case study Wishing or Prayer scores, there are no false positives but there

are false negatives. This indicates unreliability for the SRP Wishing score.

Personal Capability. The variable, Personal Capability, like Fluency and Flexibility, can be viewed for the most part as an indicator of general ability. Of all the SRP variables, Personal Capability had the highest correlation with CTBS (Table 9). Like Fluency, as a predictor of Proposal, Personal Capability failed to meet selection criteria once Flexibility had already been entered into the prediction equation (Table 10).

Fantasy Factor. Fantasy Factor was significantly, positively correlated with the SRP variable, Conceptual Thinking. It was not significantly correlated with any other variable in the study.

What is common to both of these variables might be characteristics such as confidence or willingness to take risks in expressing off-beat ideas, playfulness, and relaxation of censorship of ideas. Responses credited for a Fantasy Factor score could certainly be viewed in this way, e.g., "Rob a bank," or "Hold a cat up for ransom," (i.e., solution methods that one wouldn't really use). Some subjects even wrote a parenthetical note to explain that their Fantasy Factor suggestion was a joke.

Similar attitudinal characteristics might be seen to underly responses credited for Conceptual Thinking scores. These responses showed subjects to be truly "playing" with ideas for stopping wars as opposed to listing commonly witnessed solution strategies. (e.g., "Have a magician that would turn

weapons into harmless things like animals." "Bring back people from the dead that were good at solving these kinds of problems." For more examples, see Appendices J and L.) Further, the occurrence of Conceptual Thinking responses suggested that these subjects expected or assumed that they could generate definitive solutions to this old and complex problem. It appeared that subjects had accepted responsibility for the war problem or ownership of the problem rather than withdrawing from it. Responses reflected comprehension of the large-scale nature of the problem and an effort to generate solutions of the same level of far-reachingness (e.g., "You know the guy that has the job of sending out instructions for the war -- well, just get rid of his job in each of the countries.") It seems implicit in these large-scale solutions or holistic treatments of the problem that the subjects expected or had confidence that they could work with a problem of that scope and complexity. Thus confidence and playfulness with ideas were suggested by the Conceptual Thinking responses.

What appears to be common to Fantasy Factor and Conceptual Thinking responses is an attitude of playfulness and confidence. Therefore, the variable, Fantasy Factor, may be viewed as an indicator of an attitude or personality characteristic.

Analytic Thinking. Analytic Thinking is a somewhat puzzling variable. Its interpretation depends on logical examination of responses credited for this score as well as its relationships with a number of other variables in the study.

Analytic Thinking was significantly correlated with the SRP

"ability" variables -- Fluency, Flexibility, and Personal Capability -- but unlike these it was not significantly correlated with CTBS. It was also unlike Fluency and Flexibility in that it was not significantly correlated with Torrance Verbal Fluency and Verbal Flexibility. (See Tables 8 and 9).

Instead, it was significantly correlated with Torrance figural variables and most substantially so with the figural originality variables. There appears to be a trend toward convergence among the three variables Proposal, Analytic Thinking, and Torrance Figural Task 2 Originality. Analytic Thinking was significantly correlated with each of the other two variables. Neither Analytic Thinking or Figural Task 2 Originality were significantly correlated with CTBS. Although Figural Task 2 Originality was not significantly correlated with Proposal, it exhibited a higher correlation with it than did any of the other Torrance variables.

Intercorrelations among the scores of subjects in the case study sample also revealed interesting patterns of relationships for the Analytic Thinking variable. Analytic Thinking was significantly correlated with the case study variable, Friends. (See Appendix P for definitions of scores on the Friends variable.) Each of these two variables were also significantly correlated with the SRP variable, Personal Capability. While Analytic Thinking was at the same time significantly correlated with SRP Fluency and Flexibility, Friends was not.

These patterns of relationships suggest that while general

ability is a component of Analytic Thinking, there is also another major component underlying this variable. (The ability component of Analytic Thinking was indicated by the fact that it was significantly correlated with Flexibility, which in turn shared considerable variance with CTBS, see Tables 7, 9, and 11. Comparing Tables 13 and 15 also reveals the extent of shared variance between Analytic Thinking and CTBS in predicting to Creative Group membership.) This other component would seem to be an aspect of personality. Responses credited for Analytic Thinking revealed a willingness to apply logic and reasoning to the solution of a large-scale, complex problem. Analytic Thinking responses came from the "stop wars" problem. While such responses (e.g., make countries share; get people in different countries to know each other better; organize; use influential people) failed to deal with the problem in its entirety, they could be viewed as logically defensible steps towards the desired goal. This willingness to try, using whatever reasoning ability one possesses, rather than to withdraw from a complex problem may be the kind of personality characteristic underlying the Analytic Thinking variable. This personality component might be specified as the personality characteristic, "endurance" (from Edwards Personal Preference Scale.)

The significant correlation with Friends is suggestive of a personality component for the Analytic Thinking variable. It may be that the willingness to try or to plan or to organize (as shown in responses to the war problem) is also one part of the

constellation of characteristics encompassed by psycho-social talent.

The convergence among Analytic Thinking, Friends, and Personal Capability also is supportive of a personality interpretation for the Analytic Thinking variable. Personal Capability responses suggested that subjects viewed themselves to be capable of doing things that required ability, courage, luck, and/or influence over other people (see Appendix J for examples). Self-confidence, high expectations for one's own performance, or an "I can do it" attitude is one component of leadership ability.

It has been argued that Analytic Thinking is an indicator of the joint presence of general intellectual ability and certain personality characteristics, i.e., endurance. While these arguments for a personality component are tentatively offered (given the size and selection basis for the case study sample), they are one way of explaining why Analytic Thinking was relatively independent of CTBS (see Tables 9 and 15) but was a significant predictor of Creative Group membership.

Conceptual Thinking. Conceptual Thinking was significantly, positively correlated with Proposal, the SRP variables -- Fantasy Factor and Analytic Thinking -- and the case study variables: Wonder, Friends, and Total. From among the Torrance variables, its highest correlation was with Creative Strengths. If Analytic Thinking is interpreted as the dual characteristics of "general ability" and "endurance" and Fantasy Factor is viewed as an indicator of "playfulness", then this suggests a

rich mix of characteristics underlying the Conceptual Thinking variable. The responses credited for Conceptual Thinking reflected both playfulness and conceptual ability. (See Appendices L and J.)

The scores of subjects in the case study sample revealed a strong distinct pattern that has implications for interpreting the Conceptual Thinking variable. Case study subjects having a Conceptual Thinking score greater than zero were only those subjects having medium to high scores for both the case study variables, Friends and Wonder (Table 24). Wonder indicated the inclination to wonder about the complex, abstract, or infinite. Friends indicated successful psycho-social activeness. Each of these variables would seem to involve both ability and personality characteristics. This suggests that a very complex set of ability and personality traits are represented by the Conceptual Thinking variable. The relevance of these combined characteristics was indicated by the fact that Conceptual Thinking was the most powerful discriminator for separating the Creative Group from the Noncreative Group (Table 15).

How can one label the ability/personality characteristic represented by the Conceptual Thinking variable? From the pattern of scores in the case study sample (i.e., a Conceptual Thinking score greater than zero can be seen to reflect the joint presence of strengths on both the Wonder and Friends variables) one can offer the following statement. A subject who obtains a score greater than zero for Conceptual Thinking is one who:

- wonders about the complex, abstract, or infinite
- has psycho-social talent and places high value on activities with friends
- is able and inclined to play with ideas about a complex problem.

Examination of responses credited for Conceptual Thinking suggests that subjects had perhaps drawn from their play-with-friends experience when "playing" with the war problem (i.e., responses took the form of fantasy analogies, play-war tactics, and changing the rules or structure of a game.) Subjects making Conceptual Thinking responses would seem to be characterized by conceptual ability (as defined by dealing with the complex war problem in a holistic fashion), imagination, and spontaneity of thought. It may therefore be reasonable to suggest the label creativity -- creativity as ability and creativity as a personality type -- for referring to the characteristics represented by the Conceptual Thinking Score. It might also be argued that the activity of play with friends (at least for the case study sample) had provided for both the cognitive and affective stimulation of the creative process.

It can be argued that the Conceptual Thinking responses do in fact meet the criteria specified in the definition of creativity as ability, i.e.,

> the power of the imagination to break away from perceptual set so as to restructure ideas, thoughts, and feelings into novel and meaningful associative bonds (Khatena & Torrance, 1973). (cited by Khatena, 1976, p. 339)

The key aspects of this definition are 'the breaking away from perceptual set with resulting novelty' and 'meaningfulness'. Conceptual Thinking responses do meet these criteria or key aspects and are the only kinds of responses that did so. That subjects' imagination had broken away from perceptual set was indicated by the fact that these responses were not "commonly witnessed solution strategies". That these responses were at the same time meaningful is indicated by the fact that the solutions were of the same scale or scope as the problem itself, (i.e., they constituted a holistic treatment or conceptual approach to the problem).

It can also be argued that the characteristics of subjects obtaining Conceptual Thinking scores are consistent with the definition of creativity as personality, i.e.,

> . . . one who is attaining a secure sense of self and who is expressing positive will in selecting, organizing, modifying, and recreating his/her own experiences. This definition suggests growing self-confidence and connotes activeness as opposed to reactiveness or passivity/acceptance. (From Section 1.3.2)

These subjects had reported wondering and puzzling about complex phenomena (i.e., the Wonder score). This can be seen as an illustration of activeness in selecting and recreating experience as opposed to passive acceptance of what is. A secure sense of self is indicated by both the psycho-social talent and the self-confidence implied by the generation of the Conceptual Thinking responses. Further, the playfulness inherent in both psycho-social talent and the Conceptual

Thinking responses can be seen as a manifestation of 'recreating one's own experiences'.

These then, are the arguments for suggesting that, at least for the case study sample, the Conceptual Thinking variable is an indicator of creativity as both ability and personality type. Additional support for this argument is provided by the fact that these subjects also generated a product (i.e., the Proposal activity) which was judged to be a creative achievement.

5.2.2 Apparent Value Of The SRP Variables

Both the SRP variables, Analytic Thinking and Conceptual Thinking are creativity-relevant variables that are novel in relation to the instruments used in the study. They were the only variables in the study that had power for predicting Creative Group membership (see Section 4.3.4). The discussion in Section 5.2.1 has suggested that this is due to the fact that each of these variables represent both personality and ability characteristics.

The SRP variables, Fluency, Flexibility, and Personal Capability, on the other hand are not sufficiently novel (in relation to other instruments used in the study) in order to be of substantial value for identifying creative individuals. In predicting to performance on Proposal (the product measure of creativity) they did not make substantive significant contributions beyond that of CTBS (i.e., the academic achievement measure, see Section 4.3.2). Therefore these variables were not of practical value given the availability of

a standardized measure of academic achievement.

The Fantasy Factor variable was not of value in predicting to Proposal (see Table 9). It appeared to reflect personality characterisitics (Sec 5.2.1.) but did not at the same time tap ability. (i.e., It was not significantly correlated with Flexibility or CTBS; see Table 9.)

Therefore it was only the Analytic Thinking and Conceptual Thinking variables that offered information that was relevant to creativity and that was unavailable from other predictor instruments used in the study.

5.2.3 Adequacy Of SRP Variables

Although Conceptual Thinking and Analytic Thinking were the most powerful discriminators of the Creative Group (see Tables 13 and 15), the discriminant function developed from them was not adequate for correctly classifying a large proportion of the Creative Group. One possible explanation suggested for this was that the Creative Group comprised two different subgroups when both case study and SRP variables were examined. This lack of homogeneity in the Creative Group, however, was unlikely to account for the fact that there were more subjects who obtained scores greater than zero for Conceptual Thinking and Analytic Thinking than there were Creative Group members (i.e., Proposal=5 or 6).

It was also noted that the best equation for predicting the overall range of performance on Proposal (see Table 11) only accounted for a small percentage of the variance in Proposal.

These findings can be taken to suggest that characteristic(s) not measured in the study contributed substantially to performance on the Proposal activity.

One could speculate that the ability to organize one's efforts in a relatively unstructured situation and to proceed without frequent prompts and feedback, would be a characteristic important to success on the Proposal activity. This characteristic might be called mental maturity (which is not equated with intellectual maturity, English & English, 1958, p. 318.) It appears possible that the variable needed to more accurately predict Proposal or to better discriminate the Creative Group from the Noncreative Group is mental maturity.

5.3 Discussion

The Conclusions section has essentially presented a summary of the findings and interpretations/conclusions that may be suggested by those findings. This section will present more general discussion about what was learned about the SRP tasks or about children's expression/manifestation of creativity on the SRP tasks.

The most important observation that can be made about the SRP tasks was that it took a problem much "bigger" than the child, (i.e., the "stop wars" problem), to evoke the spontaneous use of creative thinking, (i.e., metaphorical/conceptual thinking or "playing" with ideas that dealt with a large-scale, multi-system, complex problem in a holistic manner). This in itself is interesting. The more manageable problems of getting a model jet set or a horse did not nudge children into "flights

of fancy". Only one subject (and she was in the pilot sample) gave what might be considered a high level creative response for one of the first two problems. (For the jet problem she said to put a jet costume on your pet bird. For the war problem, however, this subject gave six fantasy analogies.)

The most surprising thing about children's manifestations of creativity on the SRP (i.e., Conceptual Thinking responses) was its spontaneous occurrence. No one told subjects to generate such off-beat ideas. No one talked to them about metaphors or analogies or make-believe. The oral warm-up problem for the SRP (how someone could get across a river) did not suggest or evoke "un-real" solution methods in the six pilot administrations observed by the researcher. For some children, then, the use of the Conceptual Thinking categories of ideas was their spontaneous way of responding to the large-scale, complex SRP problem. The use of creative thinking (as defined by the Conceptual Thinking responses) as a spontaneous response to a complex problem is a highly noteworthy phenomenon because of its implications for both ability and personality (i.e., both inclination and ability are implied.) This type of behavior (i.e., the spontaneous breaking away from perceptual set and playfulness with ideas) was the same behavior that Getzels and Jackson (1962) observed when creative high school students were asked to write stories about a picture.

The definition of Conceptual Thinking response categories is important because it is different from a simple infrequency of occurrence index of original thinking, (i.e., it is a

qualitative index).

The design or format of the "stop wars" problem (i.e., the problem which evoked the Conceptual Thinking and Analytic Thinking response categories) is noteworthy because the task is complex, yet is not in a "find-the-one-right-answer" format (i.e, does not depend heavily on linear, logical, deductive, or analytic thinking) -- which is perhaps why the Conceptual Thinking variable was relatively independent from CTBS.

The relationship between Friends and Conceptual Thinking and the case study descriptions of subjects points up another issue. SRP tasks were intended to be logically related to creative behavior as it occurs in the examinee's everyday world. For many children at this age level it may be that everyday creative behavior most frequently takes place in the context of play with friends (as opposed to in the context of "problems"). It may be that tasks that tap "play with friends" contexts could be most provocative of children's creative abilities. Why then did the war problem seem to work? Perhaps the war problem was so big that, to cope with it, "Conceptual Thinker" subjects reduced it to the scale of just another game. This line of argument could imply that the instrument desired for this age level is not one called "Solving Real Problems" but rather, one called "Playing Real Games". (This emphasis or direction would be consistent with Wallach and Kogan's (1966) approach of having examinees playfully entertain possibilities in a task-centred environment.) Whether the explicit invitation to engage in fantasy, metaphor, and make-believe would aid or hinder

efficient identification of the creative individuals would be a matter for further study. The opportunity to observe the spontaneous use of creative thinking in response to a problem presented as "real" may in fact be the strength of the current SRP format.

The convergence analysis of SRP, Proposal, and Case Study variables draws attention to another aspect of children's expressions/manifestations of creativity at this age level. In Table 25, if one compares the first six subjects with the next five, one can see a trend towards two different profiles for Creative Group subjects. The second group would appear to not have the playfulness and spontaneity of the first group (i.e., as indicated by low scores on Friends and Conceptual Thinking). However, they do have the inclination to wonder about the complex; some of them demonstrated the Analytic Thinking characteristic, and all of them were able to generate a Proposal that was novel (although not germinal), appropriate, and saleable. Perhaps this type of creative child in particular, would require the explicit invitation to engage in Conceptual Thinking types of responses and/or a task that implies that it is appropriate to engage in off-beat ideas (as opposed to a serious real problem).

In this study there appeared to be two general types of creative children: those who spontaneously engage in creative thinking without specific instructions/coaching; and those who only use creative thinking when it is made explicit that it is appropriate to do so. All of the children who spontaneously

used creative thinking were socially effective/successful, at least. Some of them were very popular with friends and these children tended to make social activities/success a high priority in everyday life. This profile is suggestive of the bright but creative child who does not "appear" to be a "hard-worker" or "serious student" in the school setting. Examples of teachers' comments about such children in the case studies were: "She's one of the best students and has a good imagination but her energy's going into the social scene right now"; "She's one of the best students but she holds back in her school work so that she can stay in the group her friends are in"; or "He's accepted as a leader by his classmates, wants to be first in everything, and insists on always being the first to finish assigned work instead of doing a careful, tidy job." The parents of children with this profile expressed surprise that their children got good marks in school because they didn't seem to give it much effort. The parents of boys with this profile mentioned that their sons had been moved by their teachers to be seated far away from their friends in the class because of "talking problems".

It would seem that this attraction to social activity could serve to cloud or disguise the general ability of a creative child in a variety of ways. Understanding or accepting this social aspect of the "spontaneously creative" child would seem to have implications for their educational needs, (e.g, the obvious advantages of a classroom where academic excellence is valued by social peers and, conversely, the vulnerability of

such creative children in settings where academic excellence is socially punished.)

For the creative child who does not engage in creative thinking unless it is clearly appropriate/requested, there are also implications for educational environments. Such children would seem likely to benefit from an educational program which frequently provided explicit opportunities for the use of creative thinking. This would ensure their practice with or exercise of their creative ability. (The "spontaneous users" of creativity get such practice in two ways: they engage in creative thinking as a spontaneous response to certain types of problems; and they spend time playing with friends which provides opportunities for the use and valuing of creative thinking.)

In summary, it appears from this study that there are two types of creative children -- one type which may suffer academically without a suitable educational environment; and another type which may suffer in the area of maximally developing their creative ability. While this has been a cursory description of creative children's characteristics and the consequences of these characteristics, this brief sketch may provide ideas for further investigation. Certainly, the sketch is not inconsistent with the findings of other researchers, (e.g., Torrance, 1962; Getzels & Jackson, 1962). These findings simply provide further confirmation for the view that, without appropriate educational environments, creative children may be viewed to be "at risk".

The findings of this study also have general implications for instruments intended to identify creative children. If one wishes to identify individuals at this age level who spontaneously engage in creative thinking, then it is a large-scale, multi-system, complex problem that can facilitate this rather than a simple, single-concept one. It may well be that other children can attempt metaphorical thinking or fanciful thinking given specific instructions and perhaps coaching on how to do so. The implications, however, are of interest for researchers and educators who wish to identify individuals who use creative thinking whether or not they have been specifically instructed to do so. There is a strong suggestion from this study that it is the complex, "bigger-than-the-child" problem (which provides scope for multiple solution approaches) that must be used to spark this spontaneous use of creative thought. Problems presented in more manageable bits did not inspire the use of this kind of thinking. More simple, single-constraint, or linear-thought types of creativity test items would not seem likely to offer the kind of involvement and excitement that creative children found in the "stop wars" problem.

5.4 Future Directions For SRP Development

Further development work on SRP tasks should attempt to identify/develop tasks like the "stop wars" problem. In this study, the "stop wars" problem was submitted by subjects as being a high-interest problem. This suggested that it might be a meaningful one to subjects in the study sample. An effort

would have to be made to find other tasks that are both complex and meaningful to the population of interest. An initial examination of the "stop wars" problem suggests that to be complex, a problem should be multi-system. In other words, the problem setting must constitute a structure. Within a structure there are components which are separate and exhibit varying degrees of interdependence. For example, the physical laws governing the earth and space are one large component of the structure of the world which is the setting or context of the "stop wars" problem. The political, economic, religious, and psychological systems would be examples of sub-components of the main component related to what governs people's actions. When a complex structure is the context of a problem, and the structure includes components which are highly interdependent, then there are a large number of entry points or possible approaches to solving the problem. In other words, instead of there being one right answer which can be arrived at through careful reasoning or deductive thinking, there is ample scope for creative thinking on the part of individuals whose knowledge, skills, talents, and interests might be in diverse areas. Thus complexity of a problem might be defined in terms of the number and variety of components within the structure which is the context of the problem.

To meet the criteria of "meaningful to the population of interest" the problem should be one that is considered to be of high importance to the examinees.

It is likely that only pilot testing will clearly indicate

whether a problem is sufficiently complex, big, and important so as to capture the imaginations of creative examinees. However, if the problem which appears large and complex is identified/submitted by members of the population of interest that would be one clue to its suitability. An instrument like the "What's a Real Problem Questionnaire" (Appendix D) could be used for this purpose. This instrument provides examples of problems before asking subjects for their submissions. Using the "stop wars" problem as one of these examples might elicit more suggestions of problems on that scale.

In addition to presenting a complex problem as a real problem, a future SRP should include a task which implicitly and explicitly invites metaphorical thinking and provides an appropriate warm-up activity. These two kinds of tasks (i.e., the serious problem and the game-like problem) might be best administered to subjects as separate instruments with different names. When administering the serious, complex problem it may be desirable to preceed it with a more manageable serious problem such as the "jet problem" was. In this way, all subjects would experience some form of success with the instrument. Also, the small manageable problem may be important for establishing a certain response "set" before examinees encounter the large-scale complex problem.

It does not appear worthwhile to pursue further development of the variables, Fluency and Flexibility. These variables provided little predictive information beyond that already contained in the CTBS scores. It seems that primary mental

ability type measures of divergent thinking provide little information in this situation beyond that already available in a standardized measure of academic achievement.

Variables such as Wishing, Fantasy Factor, and Personal Capability should be retained for further exploration. They may be useful for defining profiles of different types of creative subjects or for separating the Creative from the Noncreative group within a profile type.

A less heterogeneous sample would be of great value in future research with SRP type tasks. The Creative Group in this study was small (15 from a possible 224 subjects who submitted Proposals). With a sample that yielded a larger proportion of Creative Group subjects, research questions could be asked and answered with more confidence and clarity.

5.5 Limitations Of The Study

(1)The study involved students from grade five classes in one school district and therefore generalizations should be limited to groups from a similar population.

(2)Generalizability of the interpretations developed for the SRP variables, Conceptual Thinking and Analytic Thinking is limited by the fact that students included in the case study sample who had scores greater than zero for these variables all had high scores on the Proposal variable. In other words, the interpretations offered may not be meaningful at lower levels of performance on Proposal. What remains to be explored is whether subjects in the Noncreative Group who have scores greater than

zero for Analytic Thinking and Conceptual Thinking are different from the Creative Group subjects. Would correlations among case study variables and SRP variables for this group be the same as those obtained for the Creative Group? Would a measure of mental maturity constitute the main difference between these two groups?

5.6 Summary Of Implications For Further Research

It would appear worthwhile for further research regarding SRP tasks to consider the following issues or questions.

1. Can other SRP tasks be developed which are capable of evoking the Conceptual Thinking and Analytic Thinking responses? Would such complex tasks have a relatively universal appeal to subjects of this age group in different communities? Would less complex tasks (which do not evoke Conceptual Thinking or Analytic Thinking responses) be necessary as preliminary warm-up tasks?

2. Can the interpretations suggested for the variables Conceptual Thinking and Analytic Thinking be confirmed by further research? For example, would Conceptual Thinking and Analytic Thinking scores have the same meaning (as indicated by case study variables) for subjects scoring lower on Proposal than did the Creative Group? Stated more specifically, case studies would have to be compared for Creative Group members and Noncreative Group members, all of whom had scores for Conceptual Thinking and/or Analytic Thinking.

3. Can the variables needed for improved prediction of Proposal

be identified? Would such variables account for the difference between subjects low or high on Proposal but high on Analytic and Conceptual Thinking? Would such variables contribute substantially to the prediction of the full range of Proposal scores?

4. Can tasks which implicitly and/or explicitly invite the use of metaphorical thinking and playfulness with ideas aid in the more effective identification of Creative Group members?

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